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Department Of Pesticide Regulation
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PESTICIDE RISK REDUCTION IN CALIFORNIA PRUNES

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Abstract

Pesticide Risk Reduction in California Prunes, Pest Management Alliance (PMA) Project, is part of the Integrated Prune Farming Practices (IPFP) Program. IPFP serves as an umbrella project for several projects relating to reduced-risk of pesticides in prune production including the PMA Project. Project objectives are: 1) Develop and implement replacement pest management systems impacted by FQPA. 2) Reduce surface water contamination by Diazinon and other organophosphates. 3) Reduce groundwater contamination by herbicides. 4) Evaluate ground covers and cover crops for their ability to increase biological control of pest organisms and reduce groundwater contamination by toxic pesticides. 5) Optimize nitrogen and other nutrient programs. 6) Optimize water use. 7) Reduce human exposure to pesticides . 8) Reduce risks to urban environments. 9) Delay resistance to currently used materials.

During 1999, dormant applications of Diazinon (OP insecticide) were eliminated in all demonstration/research sites, in-season pesticide applications were based on pest monitoring protocols, if pest control was needed softer pesticides were used, cover crops were encouraged where they fit in, plant nutrient applications were based on plant and water analysis and irrigation water was significantly reduced in many of the sites.

Agreement No. 97-0284 in part supported the IPFP Program for the first year full year. A great deal has been accomplished by the prune industry after the first year toward pesticide risk reduction in California Prunes. We are aware that fully reaching the stated objectives will take multiple years. The prune industry is committed to accomplishing the objectives.

Executive Summary

Pesticide Risk Reduction in California Prunes, Pest Management Alliance (PMA) Project, is part of the Integrated Prune Farming Practices (IPFP) Program. IPFP serves as an umbrella project for several projects relating to reduced-risk of pesticides in prune production including the PMA Project. Project objectives are: 1) Develop and implement replacement pest management systems impacted by FQPA. 2) Reduce surface water contamination by Diazinon and other organophosphates. 3) Reduce groundwater contamination by herbicides. 4) Evaluate ground covers and cover crops for their ability to increase biological control of pest organisms and reduce groundwater contamination by toxic pesticides. 5) Optimize nitrogen and other nutrient programs. 6) Optimize water use. 7) Reduce human exposure to pesticides . 8) Reduce risks to urban environments. 9) Delay resistance to currently used materials.

During 1999, dormant applications of Diazinon (OP insecticide) were eliminated in all demonstration/research sites. Asana was applied in the conventional blocks and if a dormant treatment was needed in the reduced risk block, oil was applied. In-season pesticide applications were based on pest monitoring protocols. Ten separate monitoring protocols were developed for monitoring prune pest through the year. If pest control was needed softer pesticides were used, such as Bt. Covercrops have been established in 9 different prune orchards; after getting well established we will monitoring the effect they have on the prune orchards including soil health and biodiversity of beneficial organisms. Plant nutrient applications, fertilizations, were based on plant and water analysis and in most cases less than what the grower would have used. Irrigation water was significantly reduced in most of the IPFP sites.

Agreement No. 97-0284 in part supported the IPFP Program for the first year full year. A great deal has been accomplished by the prune industry after the first year toward pesticide risk reduction in California Prunes. We are aware that fully reaching the stated objectives will take multiple years. The prune industry is committed to accomplishing the objectives.

Report

Introduction:

The California Prune Board (CPB) is a State Marketing Order that represents the 1,400 growers and 21 packers of California prunes. California produces about 200,000 dried tons annually on 81,000 bearing acres. California prune production represents 99% of the US total and about 70% of the world total. The annual crop value is approximately $200 million.

Although prune growers in the state must contend with a variety of insect, disease, nematode, and weed pests, the number of severe problems are relatively few when compared to other stone and pome fruits such as peaches and pears. In many cases prunes can be grown with a minimum of synthetic fertilizers and pesticides. The California Prune Board has long been committed to reducing high-risk inputs and the adverse environmental effects connected with their use. Because of this support a significant knowledge base has been developed which allows growers to move toward a reduced-risk pest management system.

The focus of the PESTICIDE RISK REDUCTION IN CALIFORNIA PRUNES project is to expand and strengthen current efforts and improve communication and cooperation to implement existing reduced risk management strategies on prunes. This project compliments and adds to the existing and past CalEPA/DPR projects and grants from UC/SAREP, USDA/CSREES and USDA/NRCS to the California Prune Board (CPB) and projects supported by CPB.

Even though the CPB has been supporting IPM research for the past 20 years, the process of getting the industry to implement IPM technology in prunes began 3 years ago with the Biological Prune Production (BPS) and the Environmentally Sound Prune System (ESPS) projects.

Work plan objectives are to:

1. Significantly reduce risk of pesticides in prunes by alternative pest management strategies.
2. Add to the progress already made with past CalEPA/DPR/PMA support including adding demonstration sites and number of field meetings.
3. Validate and implement management of peach twig borer and other lepidopterous pests by using *Bacillus thuringiensis* (Bt) and other less toxic materials.
4. Validate and implement monitoring techniques for prune rust, brown rot, mites, aphids, scale insects and lepidopterous pests in prunes.
5. Demonstrate the use of covercrops for mow and blow weed control technique, and to increase soil health, biodiversity for beneficial organisms, reduce pesticide run-off and provide habitat for wildlife protection.
6. Demonstrate and implement optimum irrigation scheduling techniques to prevent excessive irrigation that increases runoff and ground water contamination.

This project is: 1) Developing and implementing replacement pest management systems impacted by FQPA by minimizing the use of, and finding alternatives for organophosphate insecticides, fungicides, nematicides and herbicides under review by FQPA. 2) Reducing surface water contamination by Diazinon and other organophosphates. 3) Reducing groundwater contamination by herbicides. 4) Evaluating ground covers and cover crops for their ability to increase biological control of pest organisms and reduce groundwater contamination by toxic pesticides. 5) Optimizing nitrogen and other nutrient programs. 6) Optimizing water use. 7) Reducing human exposure to pesticides is a result of the prune program. 8) Reducing risks to urban environments. 9) Delaying resistance to currently used pesticides.

Demonstration and Implementation of this project will demonstrate the feasibility of growing stone fruits while greatly reducing the reliance on toxic pesticides. This could be especially important in almonds, cling peaches and fresh stone fruits where similar pest complexes occur. Grape growers near prune orchards would also benefit because prunes act as a reservoir for grape leafhopper parasites.

Materials and Methods:

A Management Team, (see in acknowledgements Management Team Members), was established in June 1998 to develop the Integrated Prune Farming Practices (IPFP) project. Where possible, BPS and ESPS projects were combined to form the core of the IPFP project. Additional demonstration/research sites were initiated so that all sites in the IPFP project were a replicate and contained conventional farming practices, reduced pesticide use risk and a control or untreated check. The total number of field plots was determined by the total support money from the various sources, see table: IPFP Demonstration/Research Plots. All prune growing areas in California are well represented with the chosen selection of the plots. It should be noted that the Pest Management Alliance (PMA) funding supports site numbers 7, 9, 11, 15, 19 and 22. These 22 prune growers represent approximately 7% of the current bearing prune acreage in California. The backbone of the IPFP Project has been built around "Pest Management Evaluation for California Prunes", (this document is not attached but is available for anyone who wishes to see a copy). Grower survey data were taken to establish current pest control methods for each grower during the winter of 1998-99, (IPFP Base Line Grower Information form was attached in previous quarterly reports). The growers pesticide use data will be reviewed periodically during the duration of this project to see if pest control techniques change. CalEPA/DPR/Pesticide Use Data will also be used to evaluate pesticide use by the prune industry during this project.

Field scouts who were supervised and guided by field technicians intensively monitor each plot weekly. Information collected included: insects, diseases, nutritional data, moisture monitoring, and harvest samples. This information was collected at each location and each location consisted of the conventional, reduced risk and untreated control plots. (See IPFP Protocols in previous quarterly report attachments for specific monitoring methods). In addition to pest monitoring, the field scouts took pressure bomb

readings in the plots to recommend irrigation scheduling. Leaf samples and irrigation water were sampled in season as a basis for fertilization recommendations. Harvest fruit samples were collected from each plot at each site and are currently being evaluated for quality, and yield comparisons.

During the growing season each grower received the weekly monitoring results. As the season progresses, we were able to help the grower decided when not to treat for specific pests. When treatment was necessary, then the choice of a safer material was recommended when appropriate. We also informed the grower weekly about irrigation status. Nutritional information will be communicated to the grower this coming winter. The protocols are ever changing and will continue to be so until we get the protocol to the point that a PCA would use it in everyday monitoring.

A key component of the project is to follow the BIOS model of field meetings and demonstrations in a timely manner and encourage participation by growers. Field days were held at various PMA demonstration and satellite orchards to view various operations, discuss results, and/or to demonstrate monitoring and other techniques. Farm advisors and the BPS coordinator were primarily responsible for planning and conducting meetings with their growers. Techniques such as the use of degree-days, traps, beating trays, cardboard bands and presence/absence leaf sampling for estimating populations of beneficial insects, leafrollers, PTB, San Jose scale and/or mites were demonstrated as was the use of a pressure bomb as a tool for irrigation scheduling and tissue sampling to determine optimum nutrient levels.

The California Prune Board also participated in outreach to all 1400 prune growers in California and strengthened communications/technology transfer with prune industry members via:

a. Quarterly newsletter
b. Annual report
c. Industry meetings
d. Via e-mail by developing:
    - Web page with prune research results
    - Bulletin Board and/or chat room
    - Prune Listserver

Bt was substituted for dormant organophosphate treatments for management of PTB and other lepidopterous pests. In order to replace the prophylactic use of Bt, monitoring techniques were developed by using data collected during the weekly monitoring to develop treatment thresholds.

Field scouts monitored plant moisture status weekly with a pressure bomb while performing their other weekly monitoring tasks. These data were made available to participating growers to be used in irrigation scheduling.

Tissue and irrigation water samples were taken during the growing season at each plot. The results will be used to base fertilizer recommendations during the fall and winter.

Next year the project will continue some of the paired plots and add to the progress already made with past CalEPA/DPR/PMA support by adding demonstration sites and number of field meetings. Some of the plots with paired comparison (conventional vs reduced risk) will be converted to demonstration plots only to reduce the amount of monitoring and to increase the number of growers in the project. PMA plots will go from 6 to approximately 10 sites and total IPFP plots to approximately 30 sites from the current 22 locations. Earlier planning this fall will allow us to add 3-5 additional field meetings. We will also start discussions with CPAs this winter to see how we can streamline our protocols to make them more PCA-friendly.

Results:

Significantly reduced risk of pesticides in prunes by alternative pest management strategies: In the 22 locations, dormant organophosphate (OP) sprays were eliminated in the IPFP and control plots and treatments applied according to in-season monitoring where necessary. When treatments were needed, softer materials were selected if available. Although all the data have not been processed, it is easy to see we have significantly reduced the risk of pesticides in our plots. We will try to validate the reduction with DPR/Pesticide Data when available and resurvey the participating growers.

The "Pest Management Evaluation for California Prunes" was revised this past year. It received further revision to fit the USDA Crop Profiles. The "Crop Profile for California Prunes" can be see at: http://pestdata.ncsu.edu/cropprofiles/Detail.CFM?FactSheets__RecordID=66. Because of the length of the evaluation and the crop profile, neither document is attached but is available for anyone who wishes to see a copy.

Add to the progress already made with past CalEPA/DPR/PMA support including adding demonstration sites and number of field meetings: We were able to more than double earlier efforts by increasing to 22 sites throughout prune productions areas of California. Four Management Team meetings have been held, (minutes of meetings were included in previous quarterly reports). Four IPFP Newsletters have been sent to all prune growers, see attached November 1999 issue (IPFP Newsletters were included in previous quarterly reports). A web page for prune research has been put on line at http://fruitsandnuts.ucdavis.edu/prune. Even though we had planned to use the Internet chat room for weekly meetings of everyone involved in the project, it was met with too much resistance. We were able to use the chat room effectively with the 3 head field technicians and the project leader. The chat room on the Internet shows promise as a cost effective method of keeping everyone current on the project thus we will be looking at ways in the future to better utilize this tool. An e-mail list server has been created to aid communications with all participants of the project. Twenty IPFP meetings were in 1999. It is interesting to note that there have been 6 articles in the newspapers or magazines from parties outside the project,

Validate and implement management of peach twig borer and other lepidopterous pests by using Bacillus thuringiensis and other less toxic materials: The monitoring protocols were evaluated during the season and were modified to help us make pest management decisions. The 22 different locations have provided data to evaluate this winter to see if the protocols need to be modified further. We did have more worm damage than we wanted in one plot so will be closely looking at the data for that prune orchard.

Validate and implement monitoring techniques for prune rust, brown rot, mites, aphids, scale insects and lepidopterous pests in prunes: As stated above the 22 orchards with essentially three monitoring sites at each location (conventional, reduced risk and control) have provided us a lot of data to analyze in the next several months. We had eight locations with significant aphid populations, so will be using this information to see how we can make improvements in the monitoring and thus pest control recommendations.

Demonstrate the use of covercrops for mow and blow weed control technique, and to increase soil health, biodiversity for beneficial organisms, reduce pesticide run-off and provide habitat for wildlife protection: Covercrops have been established in 9 different prune orchards; after getting well established we will monitoring the effect they have on the prune orchards including soil health and biodiversity of beneficial organisms. In cooperation with Frank Zalom, UC Davis, one of the covercrop plots is being used to measure pesticide runoff from dormant OP applications. Additionally, we have established two shrub demonstrations to be used for a filter/hedgerow. Another plot was used to develop baseline data on birds with the idea of using covercrops in the prune orchard and a neighboring bird habitat. Tissue and irrigation water samples have been taken and the results will be communicated to the grower with recommendations on fertilization for the coming year.

Demonstrate and implement optimum irrigation scheduling techniques to prevent excessive irrigation that increases runoff and ground water contamination: Pressure bomb readings were taken throughout the growing season to measure water/tree stress. Irrigation recommendations were made based upon the pressure bomb readings. It was interesting to note that most of the growers wanted to irrigate well ahead of the time we recommended. Results from harvest as to quality and yield have to be analyzed before we know for sure but it looks like we can prevent excessive irrigation and less runoff by utilizing the pressure bomb to schedule irrigations.

Discussion:

It is too early to draw clear conclusions on the results of the project at this stage because all the data are still being tabulated and analyzed. However, we can say that the project has progressed well and is doing better than even the project leader felt it would at this point. A brief summary of each of the 22 locations is attached; (see IPFP Demonstration/Research Plots September 1999). Again, locations 7, 9, 11, 15, 19, and 22 are the PMA sites. The time is right to make this project the success we hoped it would

be from everyone's standpoint. That is not to say that we are anywhere near completion or that we have the problems solved as that is not the case. It will still take several years to resolve issues like aphids, Peach Twig Borer, mites, rust, brown rot and etc. and put them into an economic reduced-risk pest management program. The prune industry has the earnest desire to make this project a reality. The results of this year's project have shown this.

We will be spending a lot of time evaluating the data generated this growing season, see attached Environmentally Sound Prune Systems (E.S.P.S.) and IPFP Sites Progress Report December 1999. Each grower will receive the summary data from his farm and we will discuss what it means to him in his particular situation. Based upon these results we will adjust the IPFP Project, as the Management Team deems necessary. The Management Team is already looking at ideas to help the project add additional grower sites, more field meetings, work with PCAs to see if the protocols can be streamed lined for commercial use. A major addition to the Prune Board IPFP Newsletter is to interview and feature 1 or more participating growers in each newsletter in the future.

Summary and Conclusions:

As noted in the discussion above it is still too early to draw many definitive conclusions. We have developed a very ambitious effort to reduce pesticide use risk in the prune industry and the industry has been very receptive thus far. Our approach of using large numbers of locations in all the major prune production areas has given us the ability to see numerous problems under different circumstances and attest to whether or not our monitoring protocols are adequate, or need to be adjusted. We will be able to see if our recommendations truly demonstrate that prune growers can have a cost effective, reduced-risk pest control program.

During 1999, dormant applications of Diazinon (OP insecticide) were eliminated in all demonstration/research sites, in-season pesticide applications were based on pest monitoring protocols, if pest control was needed softer pesticides were used, cover crops were encouraged where they fit in, plant nutrient applications were based on plant and water analysis and irrigation water was significantly reduced in many of the sites.

IPFP
Demonstration /Research Plots
i.e., ESPS, SAREP/BIFS, DPR/PMA, CSREES, NRCS

	County	Project	Grower/ Ranch	Plot Size Conv./Reduced Risk/Control	Acres of Prunes Farmed	Total Acres Farmed
1.	Butte	BIFS	Onstott Orchards	15/14.5/.5	400	890
2.	Butte	ESPS	Brad Johnson	4.81/5.23/.5	75	100
3.	Butte	CSREES	Chico State Farm	20/5.82/.31	45	650
4.	Tehama	BIFS	Shasta View Farms	45/5/.5	50	50
5.	Tehama	ESPS	Confidential	9.5/12.3/.5	>22	>22
6.	Tehama	CSREES	Confidential	5.9/6.2/.3	>12	>12
7.	Tehama	PMA	Farmland Management	20/19.5/.5	694	2879
8.	Sutter	BIFS	Thiara Ranches	15/10/.3	50	250
9.	Sutter	PMA	David Crane	5.1/5.3/2.9	100	300
10.	Sutter	ESPS	John Heier	5.13/5.13/1.6	65	200
11.	Sutter	PMA	Monty Johnson	9.9/9.6/.35	130	150
12.	Sutter	BIFS	Gary Carlin	9.2/7.4/.83	70	172
13.	Glenn	BIFS	Billiou Ranches	20/20/.3	734	1213
14.	Glenn	ESPS	Willow Glenn Orchards	9/5/4	513	1750
15.	Yuba	PMA	Mariana Plant 2	5.1/5.2/.5	380	380
16.	Yuba	CSREES	Kulwant S. Johl	12.95/5.28/.25	530	600
17.	Yolo	BIFS	Joe Turkovich	9/9/<1	112	160
18.	Merced	ESPS	Confidential	71/5/1	600	2500
19.	Merced	PMA	Thiara Brothers Orchards	35/5/<1	641	800
20.	Tulare	ESPS	Dan Aguair	40/20/20	475	980
21.	Fresno	BIFS	Campos Brothers	20/4.5/.5	500	9000
22.	Madera	PMA	Sherman Thomas Ranch	40/65/1	105	700
			Total	**708**	**>6,303**	**>23,758**

ENVIRONMENTALLY SOUND PRUNE SYSTEMS (E.S.P.S.)

Bill Olson, Walt Bentley, Rick Buchner, Mark Freeman, Brent Holtz, Bill Krueger, Themis Michailides, Nick Mills, Maxwell Norton, Gary Obenauf, Carolyn Pickel, Wilbur Reil, Ken Shackel, Nadeem Shawareb, Steve Sibbett, Steve Southwick, and Fred Thomas

ABSTRACT

Due to the impending loss of many pesticides, stricter regulations on their use and concerns over contaminating natural resources this project was begun to develop, research and implement alternative practices in order to reduce pesticide use and conserve natural resources.

The core of the project revolves around monitoring and developing treatment thresholds for pest, plant nutrition and irrigation needs. Pest being studied include: European and web-spinning mites, San Jose Scale, prune aphids, peach twig borer, leaf-rollers, prune rust, and fruit brown rot.

Results from this year's pest monitoring and applying pesticide treatments only when the pest reaches the treatment threshold indicated that, by using the monitoring/treatment threshold data being developed in this project, nearly three million dollars in pesticides and their application could have been saved in 1999. Most of the savings would have been with the controversial dormant pesticide application and prune rust treatments.

Tree water status monitoring indicated that many of the growers in the program are applying more water than needed for best production. Additional savings appear to be available where tree water needs are monitored and irrigation's applied only as needed.

Some cooperators have well water with nitrate nitrogen in them, which could be utilized by the tree. This available nitrogen source could reduce the cost of applied nitrogen. Over fertilization or poor fertilization timing may be responsible for this well water contamination.

Over ten educational meetings, which discussed progress and implementation of the data being developed, were held in 1999 for an audience of 830 individuals interested in prune production. Many newsletters and a popular article was also published and widely distributed about the progress of the project. Electronic media is being used in at least three counties to advise prune growers of pest status and "reduced risk" treatment options.

PROBLEM AND ITS SIGNIFICANCE

Economics and regulations are creating change in the way prunes are farmed. Cost of farming is going up, the industry is expanding creating concerns of over production and the industry will no longer pay for small poor quality fruit. Federal acts, and California ballot initiatives such as the Federal Clean Air Act, Federal Food Quality Protection Act and California's Proposition 65 and 204 dealing with water quality establish expiration dates and/or threaten the continued use of many pesticides. Some pesticide expiration dates are scheduled for the year 2000. Regulations established by California Department of Pesticide Regulations (DPR) have created new requirements and certification for the application of pesticides. Misuse of natural resources is becoming a common environmental concern.

Alternative practices, to the conventional way prunes have been farmed, need to be researched, demonstrated and implemented to keep pace with current economics and approaching and/or existing regulations. Economic thresholds and monitoring techniques need to be discovered so that pesticide use can be safely reduced or at least used in a timely fashion when needed. Water conservation that does not interfere with prune production needs to be researched and demonstrated.

OBJECTIVES

Environmentally Sound Prune Systems (ESPS) is a research/demonstration project that 8 University of California (U.C.) Prune Farm Advisors, 2 U.C. IPM Advisors, 3 U.C. Faculty Members and 3 U.C. Specialists are participants in to advance economically and environmentally sound approaches to prune production. The project objectives involve the reduced use of biocides, more effective use of fertilizers and natural resources and encourage known useful cultural operations into a more sustainable farming system.

The overall project was begun in 1998 with support from the California Prune Board. The project is being conducted on individual prune farms ranging from Tulare to Tehama County, twenty-two sites total.

The objective is to compare cultural practices dealing with pest management, fertilization and irrigation between the conventional and more sustainable or "reduced-risk" approach to growing prunes. Reduced-risk means a reduced risk to the environment without additional risk to the grower. After a few years of establishing these comparisons, an economic comparison will also take place.

"Satellite projects" to evaluate single aspects of ESPS may be established in one or more areas. These satellite projects are "stand alone" projects. Their objectives are designed to address single researchable questions. For example, evaluating aphid control with soft chemicals. ESPS satellite projects will be reported separately by those involved.

PROCEDURE

Research/Demonstration:

In Tulare (1 site), Madera (1 site), Merced (2 sites), Fresno (1 site), Yolo (1 site), Sutter (5 sites), Yuba (2 sites), Butte (3 sites), Glenn (2 sites) and Tehama (4 sites) Counties establish trials which compare two prune farming systems to an untreated check: 1) conventional system and 2) a "reduced-risk" system. Each system will consist of at least 5 acres. The conventional system will consist of the grower's normal practices but must include an Asana and oil dormant spray. Pest control for the reduced-risk system is based on monitoring protocols that are being developed for this project (see protocol 3 at end of report for example). A small-untreated "check" area is also present at each site to help validate the two prune farming systems. The organisms being monitored for include: San Jose Scale, European Red Mite eggs, prune aphids, peach twig borer and the leaf roller complex, beneficial insects, prune rust, fruit brown rot, and spider mites. In addition, the nutrient status and tree water status is being monitored. Tree water status is being used for irrigation scheduling purposes. Field Assistants (Scouts) are doing the

monitoring in each site. There are currently nine scouts hired to do the monitoring. From using these monitoring tools recommendations are made to the grower-cooperators about pest control, fertilization and irrigation scheduling. The cooperator has agreed to apply these recommendations to the reduced-risk segment of the orchard. In some cases separate irrigation schedules can not be applied to the conventional and reduced-risk plots. In these cases our irrigation recommendations are applied in the entire block. As new monitoring techniques and recommendations become available they will be incorporated into the project. These techniques and recommendations will, most likely, come from the satellite projects described earlier and reported on below.

Evaluation of these two farming systems is being carried out using data collected throughout the season and using final plot evaluations that are conducted just prior to harvest. Additionally, these systems will be evaluated based on grade sheets, yield, and dry-away information provided by the grower cooperator.

Education/Outreach:

Each farm advisor is required to have at least one educational meeting each year focusing on the ESPS project. Farm Advisors are also encouraged to write newsletters and other popular articles about the ESPS project. Insect day-degree accumulation equipment was purchased for use in this project. E-mail and web site communication between advisors and clientele, regarding pest monitoring, day-degree accumulation and field observations is also encouraged.

Securing Additional Grant Support:

It is recognized that the California Prune Board can not support this project to the extent needed to attract rapid, wide adoption of reduced risk practices by clientele. To this end, an attempt at securing additional grant support from other agencies is being conducted to expand the project beyond the capabilities of the California Prune Board. However, securing other grant funding is contingent upon prune industry support provided by the California Prune Board.

Satellite Projects:

Projects need to be researched before being demonstrated or adopted on a wide scale. In previous years, under the ESPS project, research was conducted on: 1) Alternate year dormant spray program, 2) A predictive model for forecasting scab off-grade at harvest, 3) Aphid control using soft chemicals, and 4) Mow and throw technique of mowing cover crop, using the residue as a mulch for weed control and the use of rice straw (ag-waste) as mulch for weed control.

This year, under the ESPS project, material efficacy trials were conducted for control of prune aphids using soft materials including a number of novel products not yet registered. These satellite projects will be reported on by those involved.

RESULTS

Research/Demonstration:

Results from this year's project are first discussed by the individual monitoring protocols and

final plot evaluations and then by field evaluation of fruit at harvest. Ultimately, site grade sheets will be used to further evaluate the success of the project. This report precedes the receipt of all grade sheets.

Fall Presence-Absence Monitoring for Prediction of Springtime Aphid Populations and a Dormant Spray Recommendation Guide.

Through dormant spur monitoring we can now assess the population of European Red Mite eggs and San Jose Scale (Protocol 1). The need for a dormant treatment for these two pests can be predicted and an oil application can control these two pests. The pests that are giving us the most problem when we do not put on a dormant insecticide and oil spray, are prune aphids. Both mealy plum aphid and leaf curl plum aphid can be a problem.

To help with the aphid problem the ESPS Project has developed a fall monitoring technique to predict if aphids will be present next spring. By sampling 100 leaves per tree on 20 trees in the fall of 1998 and recording the presence or absence of aphids on a tree in the spring of 1999, we were 70% accurate in predicting the presence of mealy plum aphid populations. (Graph 1). Our accuracy for Leaf Curl Plum Aphid has not been as good. Sampling is done when 75% of the leaves have fallen off (late October- early November). To improve accuracy, we have increased the number of trees monitored for the 1999-2000 season.

If less than 5% of the sampled trees have aphids in the fall we would predict very few aphids next spring and a treatment should not be needed. If 7.5-15% of the trees sampled have aphids in the fall, the model predicts some aphid problem that may justify a treatment. If more than 15% of the trees sampled in the fall have aphids the model predicts a wide spread aphid problem next spring that would definitely require treatment (Table 1).

Using this technique we have found that 64% of the orchards did not have an aphid problem and did not need a dormant insecticide and oil treatment. For the orchards that were predicted to have an aphid problem we are recommending: 1) oil spray during or near bloom or 2) be prepared to control aphids during the growing season with standard insecticides or suppressing aphids with oil.

Coupling this monitoring technique with the dormant spur sampling technique for European Red Mite and San Jose Scale (protocol 1) we have been able to develop the following "Dormant Treatment Recommendation Guide" (Table 2).

Graph 1.

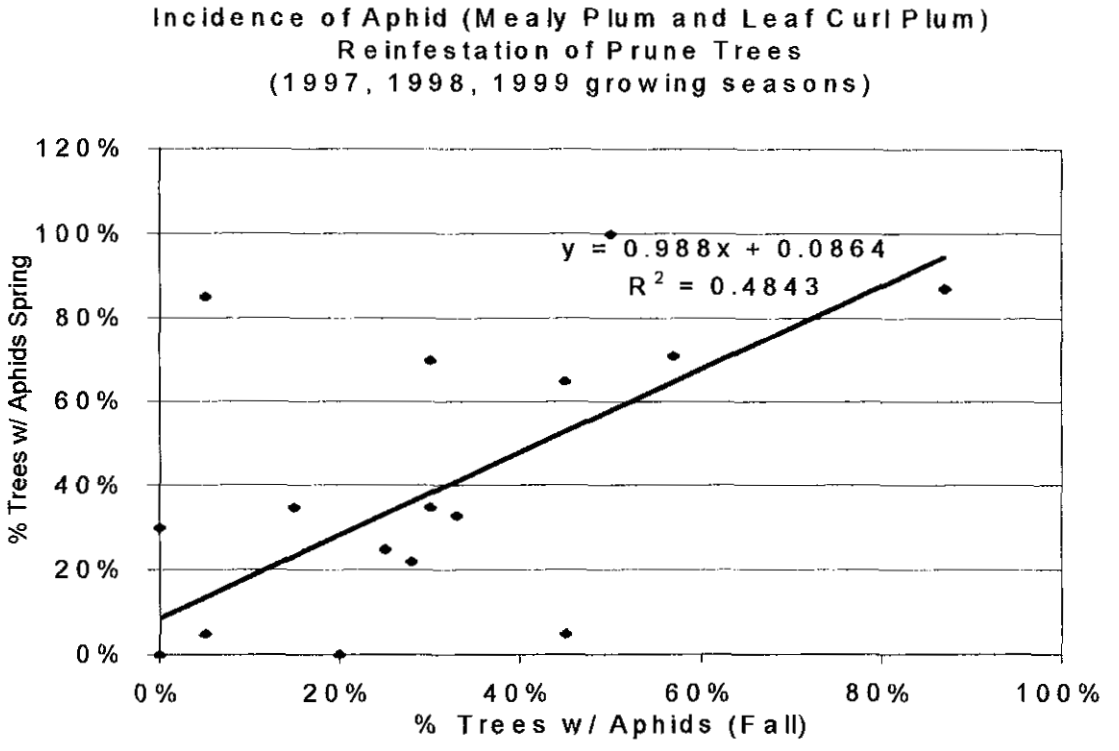


Table 1. Spring aphid prediction model.

Level of Aphid Infestation	# of Trees w/ Aphids Out of 40	% Trees Infested	Expected Spring Aphids
Level 1	0 - 2	0 - 5 %	Very Few
Level 2	3 - 6	7.5 - 15 %	Some
Level 3	7 or more	Over 15%	Wide Spread

Table 2. *Dormant Treatment* Recommendation Guide

Aphids at Level:			Mites and/or Scale Above Threshold?	Treatment Recommendation
Level 1	Level 2	Level 3		
X			No	Nothing
X			Yes	Dormant oil
	X		No	Oil at bloom
	X		Yes	Delayed dormant oil or oil at bloom
		X	No	Oil at bloom* + in-season
		X	Yes	Delayed dormant oil or oil at bloom* + in-season

* Be concerned with oil applications near Captan or Bravo.

Dormant Spur Sampling for Red Mite Eggs (ERM) and San Jose Scale (SJS)- Protocol # 1:

This monitoring protocol involved the evaluation of prune spurs once during the dormant period. If more than 10 percent of the spurs have ERM eggs or SJS crawlers, a delayed-dormant oil spray is recommended. If less than 10 percent of the spurs have mite eggs or live SJS present, no treatment is recommended. Three sites out of 22 (Madera, Fresno and Tulare) exceeded the threshold for ERM eggs. Only 27 % of the orchards (6 of 22) exceeded the treatment threshold for over wintering San Jose Scale (Butte, Sutter (2 sites), Yuba (2 sites), and Tulare (Table 3). These sites received a dormant or delayed-dormant oil spray for one or both of these pests. None of the reduced-risk sites had an ERM or scale problem during the growing season.

Table 3. % Sites Requiring Dormant Spray for ERM or SJS (22 sites total):

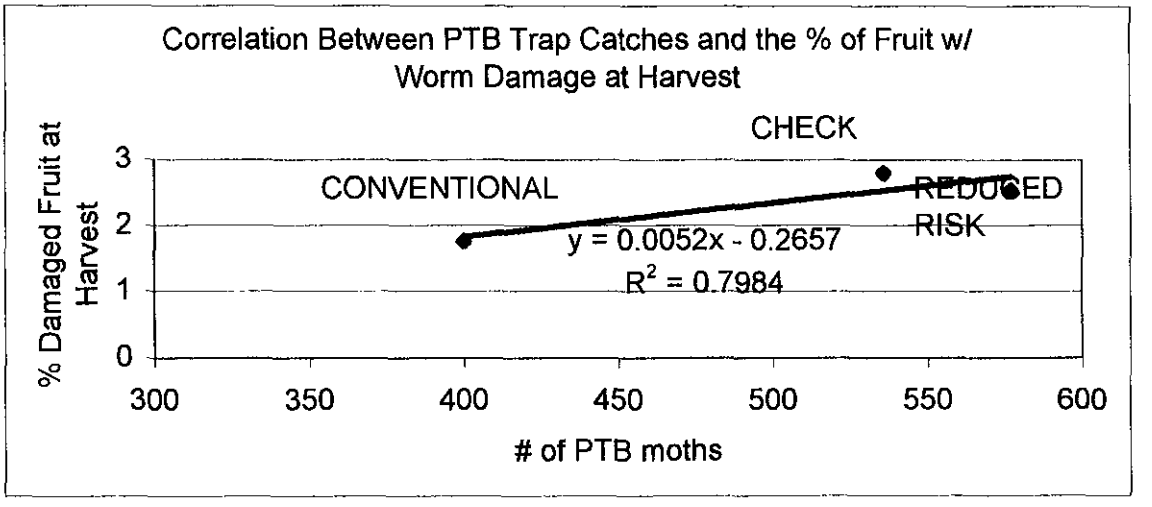
ERM eggs	SJS	Total
14%	27%	36%

Monitoring of Pheromone Traps for PTB, SJS, and Parasitoids of SJS - Protocol # 2

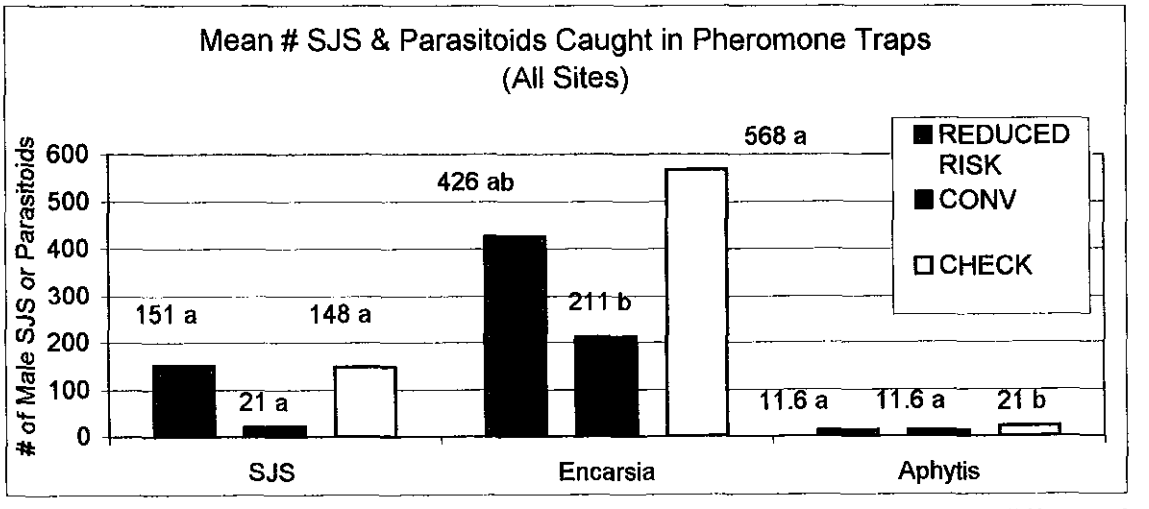
Peach twig borer pheromone trap catches in the reduced risk, conventional, and check plots were not significantly different. Peach twig borer trap catches are correlated (R=.89) to the percentage of fruit with worm damage at harvest (Graph 2).

San Jose Scale pheromone traps were used to monitor SJS and two parasitoids that attack SJS. No significant differences in pheromone trap catches were found for male SJS between the conventional, reduced-risk, and check plots. Significant differences in parasitoid populations between the test plots did occur. *Encarsia* (*Prospatella*) wasps were caught in significantly larger numbers in the check plots that the conventional. *Encarsia* trap catches in the reduced-risk plots were intermediate, but not significantly different from the check or conventional. Trap catches of *Aphytis melinus* in the check plots were significantly higher than the conventional and reduced risk plots (Graph 3).

Graph 2.



Graph 3.



Treatment means that are not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

Evaluation of Green Fruit for SJS and Parasitized SJS – Final Evaluation

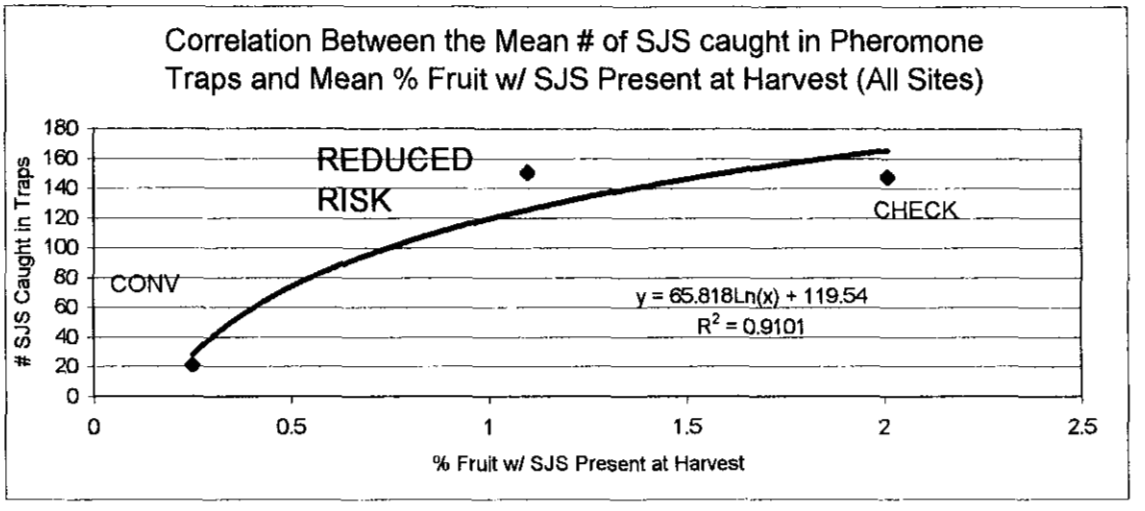
For each of the 22 sites, five hundred fruit per treatment were examined for the presence of SJS or parasitized SJS during the final evaluation. The untreated check plots had significantly more fruit with SJS present compared to the conventional plots. The reduced risk plots were intermediate and
not significantly different from the check or the conventional. No significant differences occurred in terms of parasitized SJS (Table 4). There was a strong correlation (R=.95) between the number of male SJS caught in pheromone traps and the percentage of fruit with SJS present at harvest (Graph 4).

Table 4. Mean % Fruit w/ SJS or Parasitized SJS Present at Harvest (All Sites)

TREATMENT	% Fruit w/ SJS	% Fruit w/ Parasitized Scale
REDUCED RISK	1.1 ab	.01 a
CONVENTIONAL	.25 b	0 a
CHECK	2.01 a	0 a

Treatment means not followed by a common letter are significantly different from each other at the 5% level according to Duncan's Multiple Range Test for Mean Separation.

Graph 4.



Blossom/Shoot Tip Sampling for PTB, Leaf Roller Complex, and Other Larvae (Protocol # 3)

Sampling of blossoms and shoot tips is used to determine the need for "bloom time" or "in-season" applications of *Bacillus thuringiensis* (*Bt*) to control lepidopterous larvae. Two techniques were evaluated this season. One technique (old protocol) involved random sampling of 20 blossoms and 20 shoot tips on 20 trees for the presence of damage or larvae. The mean percentage of blossoms/shoot tips with larvae or larval damage present was not significantly different for the three systems (Table 5).

The other method (new protocol) involved visual inspection of entire trees (80 per plot) to determine the presence or absence of larvae or larval damage. The conventional plots had significantly fewer trees with larvae or larval damage present compared to the reduced risk and check plots (Table 6).

For each of the 22 sites, five hundred fruit per treatment were examined for the presence of larvae or damage during the final evaluation. There were no significant differences between the three treatments (Table 7).

Table 5. Old Protocol. Mean % of Blossoms/Shoots w/ Larvae or Damage Present

TREATMENT	% Blossoms/Shoots w/ Worms or Damage
REDUCED RISK	0.56 a
CONVENTIONAL	0.39 a
CHECK	0.41 a

Treatment means not followed by a common letter are significantly different at the 5 % level according to Duncan's Multiple Range Test for Mean Separation.

Table 6. New Protocol. Mean % of Trees with Larvae or Damage Present

TREATMENT	% Trees w/ Worm Damage
REDUCED RISK	8.6 a
CONVENTIONAL	6.0 b
CHECK	9.7 a

Treatment means not followed by a common letter are significantly different at the 5 % level according to Duncan's Multiple Range Test for Mean Separation.

Table 7. Mean % Fruit w/ Larvae or Damage Present (Final Evaluation)

TREATMENT	% Worm Damage
REDUCED RISK	2.54 a
CONVENTIONAL	1.76 a
CHECK	2.80 a

Treatment means not followed by a common letter are significantly different at the 5 % level according to Duncan's Multiple Range Test for Mean Separation.

Spring Prune Aphid Monitoring – Protocol # 4:

Beginning in April, a random sample of 75-80 trees per plot is examined for the presence of leaf curl plum aphids (LCPA) and mealy plum aphids (MPA). If more than 10 % of the trees examined are infested with aphids, then a treatment is justified. The conventional plots had significantly fewer trees infested by mealy plum aphid and leaf curl plum aphid compared to the reduced risk plots and the check plots, which were statistically similar to each other (Table 8). Thirty-two percent of the reduced risk plots (7 of 22) exceeded the treatment threshold for leaf curl plum aphid. These orchards were located in Sutter (2 sites), Tehama (2 sites), Glenn (1 site), Yolo (1 site) and Butte (1 site) Counties. Twenty seven percent of the reduced risk plots (7 of 22) exceeded the treatment threshold for mealy plum aphid. These orchards were located in Sutter (2 sites), Glenn (2 sites), Merced (1 site), Madera (1 site) and Butte (1 site) Counties.

Table 8. Mean % of Trees w/ Prune Aphids Present – All Sites

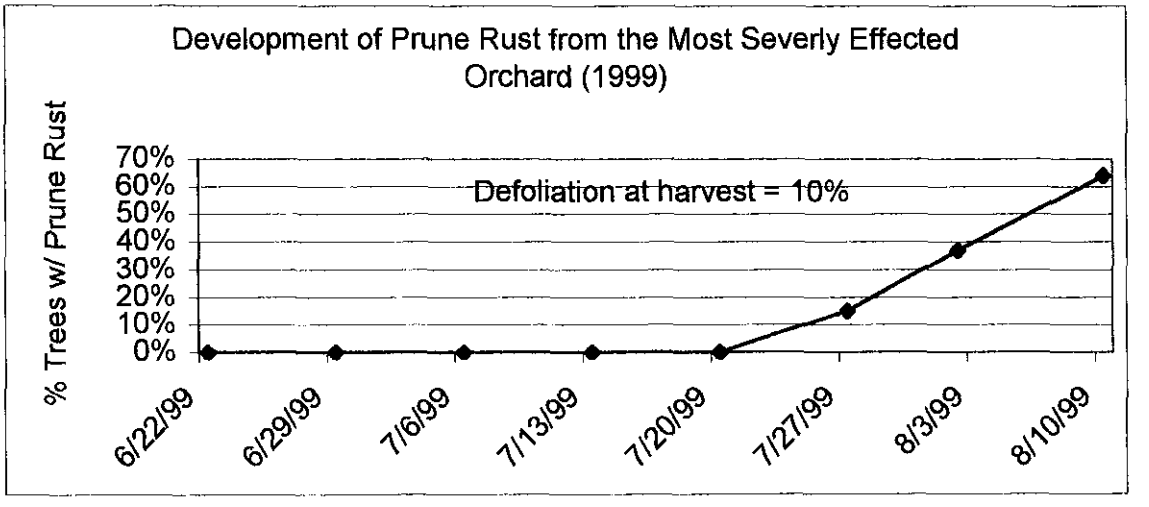
TREATMENT	% Trees w/ LCPA	% Trees w/ MPA
REDUCED RISK	12.78 a	14.6 a
CONVENTIONAL	2.05 b	2.0 b
CHECK	12.99 a	20.8 a

Treatment means not followed by a common letter are significantly different at the 5 % level according to Duncan's Multiple Range Test for Mean Separation.

Prune Rust Monitoring and Treatment Timing Recommendations:

Previous research has shown that rust treatments applied close to the onset of rust infection are most beneficial. This monitoring technique involves watching trees for the first signs of rust. Once rust is first detected, a treatment is recommended. After a rust treatment is applied, and continued monitoring indicates an increase in rust, additional treatments are recommended. Only three of the sites (14%) had rust, all in the Sacramento Valley. However, the rust did not show up till August and consequently no rust treatments were needed. Only one of the three orchards had any defoliation prior to harvest. The percent of trees with some defoliation in this orchard was 10 percent (Graph 5). Most defoliation was on young replants. The time to monitor a plot for rust took 30 minutes for one person. Monitoring took place over an 8-week period.

Graph 5.



Presence–Absence Sequential Sampling for Webspinning Mites:

Only four of the twenty-two sites were over the treatment threshold (over 53 percent of the leaves having webspinning mites with predacious mites present). Only one site was treated. This site had some defoliation, which was stopped once a treatment was applied. There was no statistical difference between webspinning mite populations or mite predator populations in the ESPS, conventional, and check plots for the 22 sites (data not shown). Monitoring for mites took 1.5 hours per week per person. Monitoring took place over a 10-week period.

Fertilization:

Plant tissue and water samples for each site were collected in July. The tissue and water nutrient data are shown in Tables 9 and 10. Highlighted tissue analysis sites indicate a deficiency in one or more nutrients. Highlighted water analysis sites indicate either high N or high salt. Five sites were considered to have low leaf nitrogen levels. Four of them were new sites to the program. Two sites were considered to have low zinc levels in the tissue samples. No sites were considered deficient in potassium or boron. In the water samples, nine sites had high nitrate nitrogen levels, and one site had high Ec levels.

Table 9. 1999 Tissue Analysis for Various Nutrients

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Butte-BJ	Conv.	2.268	2.27	44	178
Butte-BJ	ESPS	**2.153**	2.22	44	160
Butte-CSUC	Overall	2.632	3.15	66	27
Butte-OO	Overall	**2.029**	3.64	60	22
Glenn-B	Overall	2.546	3.44	71	165
Glenn-WG	Conv.	2.614	3.55	58	93
Glenn-WG	ESPS	2.306	2.73	54	36
Merced-GL	Conv.	2.923	2.18	66	21
Merced-GL	ESPS	2.467	3.23	80	17
Merced-TB	Conv.	2.367	2.74	47	17
Merced-TB	ESPS	2.67	2.07	55	182
Sutter-DC	Overall	2.284	2.25	48	18
Sutter-GC	Overall	**2.213**	2.48	52	19
Sutter-JH	Overall	2.389	2.25	45	**16**
Sutter-MJ	Overall	**2.202**	3.93	61	**14**
Sutter-TR	Overall	2.407	2.14	58	88
Tehama-F	Overall	2.245	4.05	46	20
Tehama-M	Conv.	2.38	2.89	73	263
Tehama-M	ESPS	2.59	2.49	73	26
Tehama-RB	Conv.	2.518	3.29	102	194
Tehama-RB	ESPS	2.684	3.42	106	231
Tehama-SV	Overall	2.746	3.73	71	231
Tulare-A	Conv.	2.579	3.23	59	70
Tulare-A	ESPS	2.54	2.33	51	33
Tulare-A	Check	2.482	195	57	30
Yolo-T	Conv.	3.353	1.82	46	51
Yolo-T	ESPS	2.467	2.2	51	50
Yolo-T	Check	2.464	2.08	52	47
Yuba- KJ	Overall	2.333	2.92	57	36
Yuba-M	Overall	**2.199**	3.39	47	18

Table 10. 1999 Water Analysis

County & ID	pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs.N/Acre Ft
Butte-BJ	7.2	0.67	2.5	4.5	0.9	<1	0.2	<0.1	**10.5**	**28.6**
Butte-CSU	7.4	0.34	1.6	1.7	0.4	<1	<0.1	0.1	**5.71**	**15.5**
Butte-OO	7.6	0.08	0.4	0.2	0.1	<1	<0.1	<0.1	<0.05	0.0
Glenn-B	7.7	0.63	3.1	2.5	1.3	1	1	0.3	**5.18**	**14.1**
Merced-TB	NA	0.04	0.2	0.1	0.1	<1	<0.1	<0.05	<0.05	0.0
Sutter-DC	7.2	0.24	0.8	1.4	0.5	<1	0.1	<0.1	1.3	3.5
Sutter-GC	7.4	0.08	0.4	0.2	0.1	<1	0.1	<0.1	<.05	0.0
Sutter-JH	7.2	0.34	1.1	1.5	0.8	1	0.3	0.1	**5.9**	**16.0**
Sutter-MJ	7	0.73	2.7	4.8	1	1	0.7	<0.1	**8.17**	**22.2**
Sutter-TR	7.6	0.65	2.4	3.9	1.1	1	0.3	0.1	**11.1**	**30.2**
Tehama-F	6.9	0.28	0.9	1.2	0.7	1	0.1	<0.1	**6.05**	**16.5**
Tehama-M	7	0.15	0.5	0.5	0.5	1	0.1	0.1	0.09	0.2
Tehama-RB	6.8	0.6	1.1	1.5	3.2	3	2.5	1.4	2.11	5.7
Tulare-A-1	7.8	0.26	1.2	0.1	1.4	2	0.2	0.1	2.36	6.4
Tulare-A-2	7.2	0.62	4	1	1.8	1	0.4	0.1	**10.1**	**27.5**
Yolo-T	7.3	**0.88**	2.9	5.7	2.1	1	1.6	0.43	**6.28**	**17.1**
Yuba- KJ	7	0.66	2.7	3.9	1.3	1	0.5	0.1	1.71	4.7
Yuba-M	7.1	0.55	<0.1	<0.1	1	<1	0.3	<0.1	1.76	4.8

Irrigation Management *(Objective, procedure, results):*

The reduced-risk recommended management of irrigation is based on research findings in prune, that: 1) stress can be accurately and reliably measured using the midday bagged leaf method (midday stem water potential), and 2) prune tree economic production appears to benefit from mild to moderate water stress later in the season, when dry yield is not affected but fruit hydration ratio is improved. Additional beneficial effects may also occur in prune (reduction in excess vegetative growth, increased return bloom), but these have been more difficult to clearly identify. Reduced water input is also one of the goals of ESPS, and so the objective of our irrigation management strategy are to minimize the applied water without causing detrimental effects on economic yield.

Midday stem water potential is measured by selecting an interior canopy leaf, attached near the trunk or main scaffold, and enclosing this leaf in a foil-covered black polyethylene envelope to stop leaf transpiration. After about 2 hours, at midday, the water potential of this non-transpiring leaf is measured with a pressure chamber. The relationship of this measurement to the midday conditions of temperature and humidity have been determined for fully irrigated prune trees (Table 7), and this value is used as a reference value for any particular date and site.

Table 11. Values of midday stem water potential (in Bars) to expect for fully irrigated prune and almond trees, under different conditions of air temperature and relative humidity.

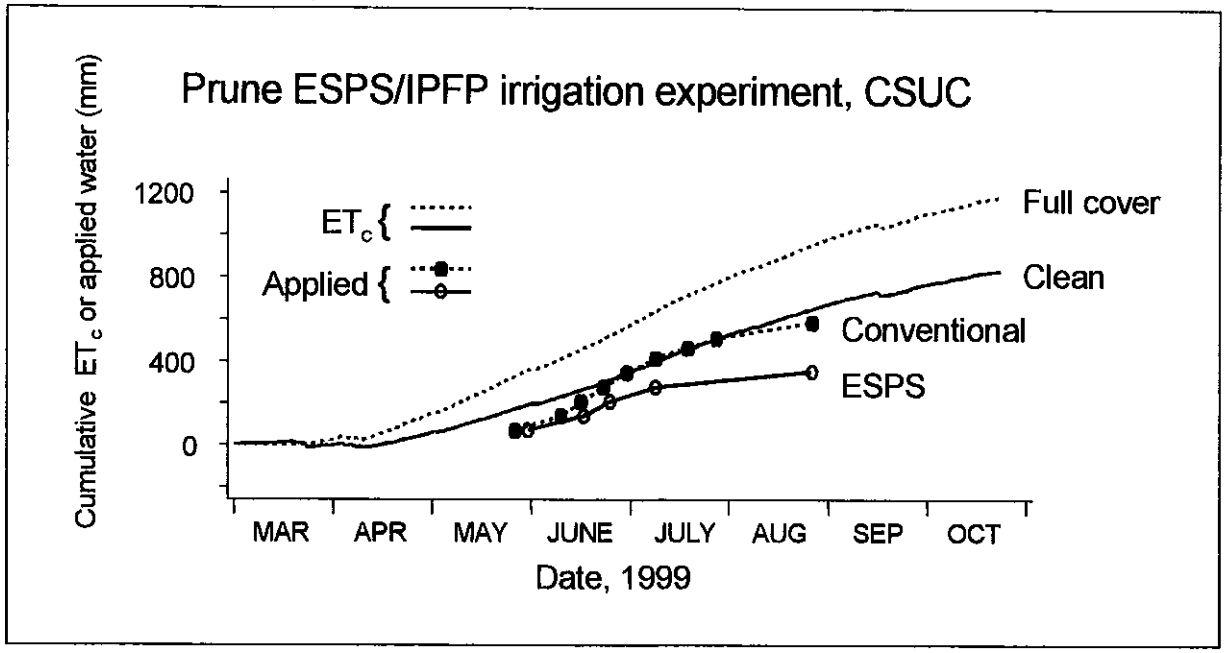
Temperature (EF)	Air Relative Humidity (RH, %)						
	10	20	30	40	50	60	70
70	**-6.8**	**-6.5**	**-6.2**	**-5.9**	**-5.6**	**-5.3**	**-5.0**
75	**-7.3**	**-7.0**	**-6.6**	**-6.2**	**-5.9**	**-5.5**	**-5.2**
80	**-7.9**	**-7.5**	**-7.0**	**-6.6**	**-6.2**	**-5.8**	**-5.4**
85	**-8.5**	**-8.1**	**-7.6**	**-7.1**	**-6.6**	**-6.1**	**-5.6**
90	**-9.3**	**-8.7**	**-8.2**	**-7.6**	**-7.0**	**-6.4**	**-5.8**
95	**-10.2**	**-9.5**	**-8.8**	**-8.2**	**-7.5**	**-6.8**	**-6.1**
100	**-11.2**	**-10.4**	**-9.6**	**-8.8**	**-8.0**	**-7.2**	**-6.5**
105	**-12.3**	**-11.4**	**-10.5**	**-9.6**	**-8.7**	**-7.8**	**-6.8**
110	**-13.6**	**-12.6**	**-11.5**	**-10.4**	**-9.4**	**-8.3**	**-7.3**
115	**-15.1**	**-13.9**	**-12.6**	**-11.4**	**-10.2**	**-9.0**	**-7.8**

Based on: McCutchan and Shackel, 1992. Stem-water potential as a sensitive indicator of water stress in prune trees (*Prunus domestica* L. cv. French). Journal of the American Society for Horticultural Science 117(4):607-611 and Shackel et al. 1997. Plant water status as an index of irrigation need in deciduous fruit trees. HortTechnology 7(1):23-29.

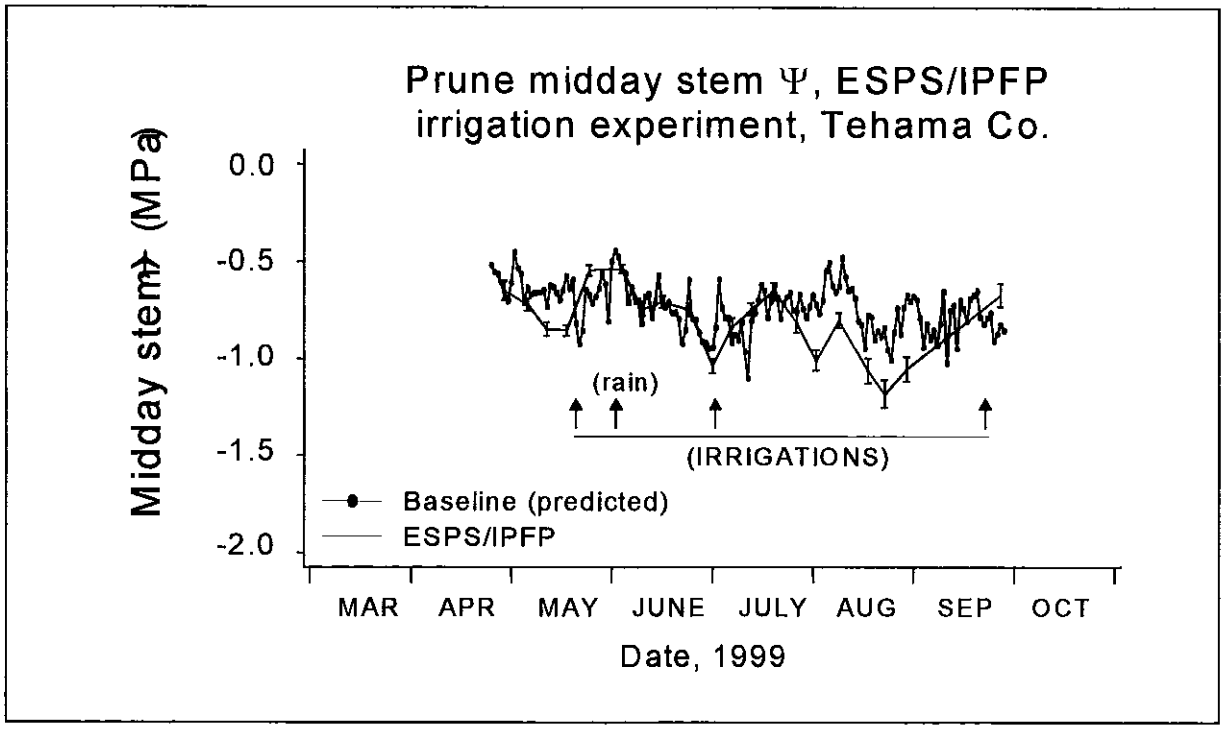
Mature prune trees can be allowed to progressively decline through the growing season towards mild levels of stress (-15 bars on average) by harvest, with no effect on yield, and some improvement in fruit quality (lower fresh fruit moisture content). Rapid recovery from a stress of -15 bars or more should be avoided during the crack sensitive period (late June/early July), and substantial recoveries should probably also be avoided near harvest, since we have associated this with increased pre-harvest fruit drop.

Each of the 22 sites were monitored using a gas or pump up pressure chamber. All sites showed the expected increases in stem water potential following irrigation and declines as soil water was depleted (Graph 6, Butte Co. and Graph 7, Tehama Co). The Butte site compared the grower's conventional practice against irrigation recommendations based on monitoring. At this location, the number of micro sprinkler irrigation's totaled nine for the conventional and five for the reduced risk plot. At the Tehama site, the entire orchard was irrigated based on pressure chamber monitoring. At this site, one timely rain and three flood irrigations were applied. The number of irrigations applied in 1999 was far less than the grower's previous practice.

Graph 6. Butte County



Graph 7. Tehama County



ONFIT Procedure – Fruit Brown Rot Predictive Model:

A predictive model for estimating fruit brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) involves freezing green fruit to reveal latent infections by *Monilinia fruticola* or *Monilinia laxa*. Levels of latent infection revealed using the ONFIT model are correlated to levels of fruit brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with a fungicide application. Results of the ONFIT procedure predicted that 8 of the 22 sites had low levels of latent brown rot present. No fungicide treatments for fruit brown rot were recommended for any of the 22 sites based on the ONFIT fruit brown rot predictive model. At harvest, 2000 fruit per plot were examined for the presence of brown rot infection. Results of the final field evaluations at harvest indicted that fruit brown rot was present at 4 of the 22 sites. Brown rot levels at harvest did not exceed 1% infected fruit at any of the 22 sites (Table 12).

Table 12.

	% Infected Fruit or Clusters of Fruit			
County and Site	ONFIT Prediction	Brown Rot Present at Harvest		
	ESPS	ESPS	CONV	CHECK
Butte - CS	0%	0.2	0	0
Yuba - KJ	0%	0	0	0
Yuba - MP	1%	0	0	0
Butte - BJ	1%	0	0	0
Sutter - MJ	0%	0	0	0
Sutter - DC	0%	0	0	0
Sutter - GC	1%	0	0	0
Sutter - JH	0%	0	0	0
Tehama - VM	0%	0	0	0
Tehama - RB	0%	0	0	0
Glenn - WG	0%	0.1	0	0
Yolo - JT	0%	0	0	0
Merced - GL	0%	0	0	0
Merced - TB	0%	0	0	0
Fresno - CB	0%	0	0	0
Tulare - DA	0%	0.45	0	0
Madera - ST	0%	0	0	0
Glenn - B	1%	0	0	0
Butte - OO	4%	0	0	0
Tehama - FM	2%	0	0	0
Tehama - SV	5%	0	0	0
Sutter - TR	6%	0.05	0.35	0.85

Yield and Quality Evaluation from P-1 Gradesheets:

Yield and quality grade sheets ("P-1") were not received in time to be included in this report.

Education/Outreach:

Each participant advisor held one or more educational meeting which discussed the ESPS project. Over 830 people received information on the ESPS project at meetings. Following is a list of meetings held, dates, and subjects covered:

County	Date(s)	Subjects Covered
Butte/ Sutter	1/20, 3/4, 10/8, 10/10/99	Sprayer calibration, ESPS case history, ESPS overview, Aphid monitoring
Glenn	5/5/, 11/17/99	Vegetation to reduce dormant spray runoff, ESPS overview
Merced	Twice monthly during Spring and summer	Pest updates
Tehama	5/6/, 10/6/99	Cover crop planting, ESPS overview
Tulare	2/26/99	ESPS overview
Yolo	5/13/99	ESPS overview, prune aphids

In addition, Tehama, Glenn, and Butte County advisors provided insect day degree accumulation to clientele via e-mail or web site on a regular basis. Advisors wrote several newsletters and one popular article was published.

Securing Additional Grant Support:

Additional grant support was solicited and secured from several sources. Listed below are the sources of each additional grant that is being used to support this project:

DPR-Pest Management Alliance
BIFS/SAREP
USDA/CSREES
USDA/NRCS

CONCLUSIONS

Research/Demonstration:

Fall Presence-Absence Monitoring for Prediction of Springtime Aphid Populations and a Dormant Spray Recommendation Guide.

The fall aphid sampling was only 70 percent accurate in predicting mealy plum and leaf curl plum aphid populations in the spring. The technique was more accurate in predicting mealy plum aphid than in predicting leaf curl plum aphid. This monitoring protocol has been modified to improve the ability to predict aphid populations and will be tested in the fall of 1999 and spring of 2000.

The "Dormant Spray Recommendation Guide" was very useful. This guide accurately predicted a dormant insecticide and oil treatment would be useful in controlling aphids and/or SJS and /or ERM in 64 percent of the orchards and that 36 percent of the orchards would not benefit from a dormant treatment. Not treating 36 percent of California's bearing prune orchards with a dormant insecticide and oil spray would save the industry approximately $1,102,000 and go a long way in demonstrating a reduction in pesticide use and a conscious effort to reduce pollution of our natural resources.

Dormant Spur Sampling for European Red Mite (ERM) Eggs and San Jose Scale (SJS) Crawlers:

This sampling technique has the potential of helping to decide if a dormant insecticide spray is justified. Only 8 of the 22 orchards needed a dormant treatment for SJS or ERM. Since grade sheets report several defect categories together, we have found it necessary to use harvest time fruit evaluations in the field to accurately validate our thresholds for SJS on the dormant spur samples.

Pheromone Trap Monitoring for PTB, SJS, and for Parasitoids of SJS – Protocol # 2:

Peach twig borer pheromone trap catches in the reduced risk, conventional, and check plots were not significantly different. Peach twig borer trap catches are correlated (R=.89) to the percentage of fruit with worm damage at harvest.

No significant differences in pheromone trap catches were found for male SJS between the conventional, reduced-risk, and check plots. Significant differences in parasitoid populations between the test plots did occur. *Encarsia* (*Prospatella*) wasps were caught in significantly larger numbers in the check plots that the conventional. *Encarsia* trap catches in the reduced-risk plots were intermediate, but not significantly different from the check or conventional. Trap catches of *Aphytis melinus* in the check plots were significantly higher than the conventional and reduced risk plots.

Based on fruit evaluations at harvest, the untreated check plots had significantly more fruit with SJS present compared to the conventional plots. The reduced risk plots were intermediate and were not significantly different from the check or the conventional. No significant differences occurred in terms of parasitized SJS. There was a strong correlation (R=.95) between the number of male SJS caught in pheromone traps and the percentage of fruit with SJS present at harvest suggesting high trap catches would indicate a significant number of SJS on fruit.

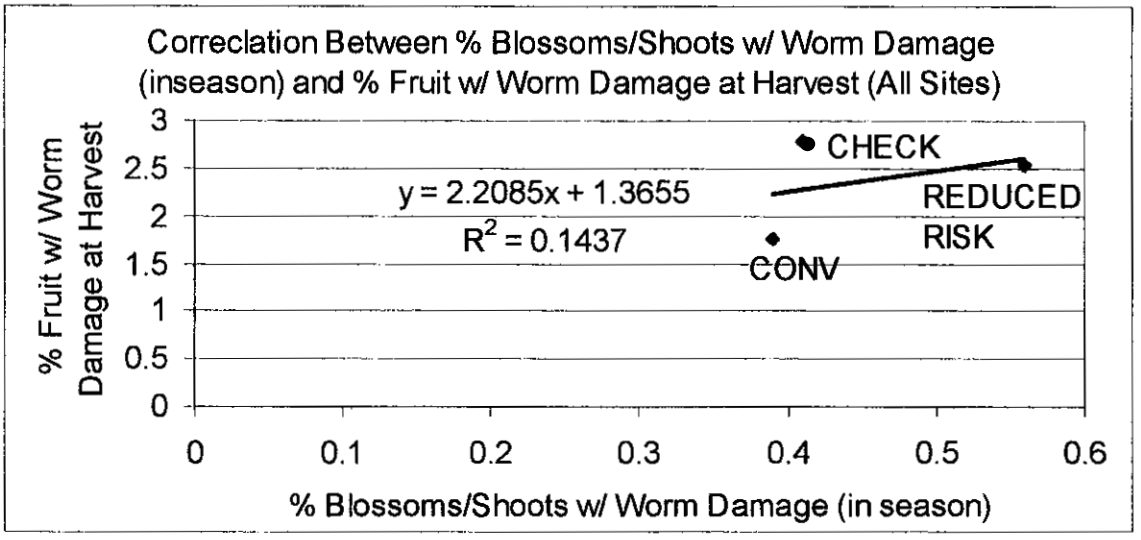
We are finding that both the dormant spur sampling and use of pheromone trapping provide the grower with useful information.

Shoot Tip and Blossom Sampling for Evaluating the Presence of Peach Twig Borer and the Leafroller Complex:

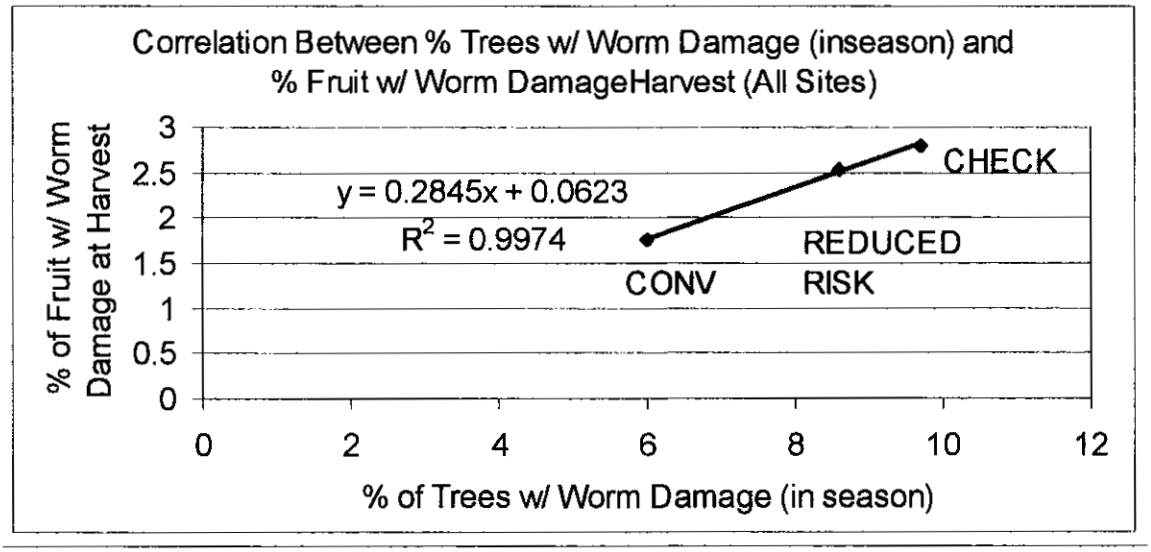
The new protocol, which involves evaluating entire trees for the presence of absence of larvae or damage and looking at more trees, has greatly improved the accuracy of this monitoring technique. Using the old protocol, there was not a strong correlation (R=.37) between the percentage of blossoms/shoot tips damaged and the % of fruit with worm damage at harvest

(Graph 8). Using the new protocol, there is a strong correlation (R=.99) between the percentage of trees with larvae/damage present and the percentage of damaged fruit at harvest (Graph 9). Shoot and blossom monitoring for PTB and leafrollers can help determine the need for a *B.t.* spray as well as the optimum treatment timing.

Graph 8



Graph 9



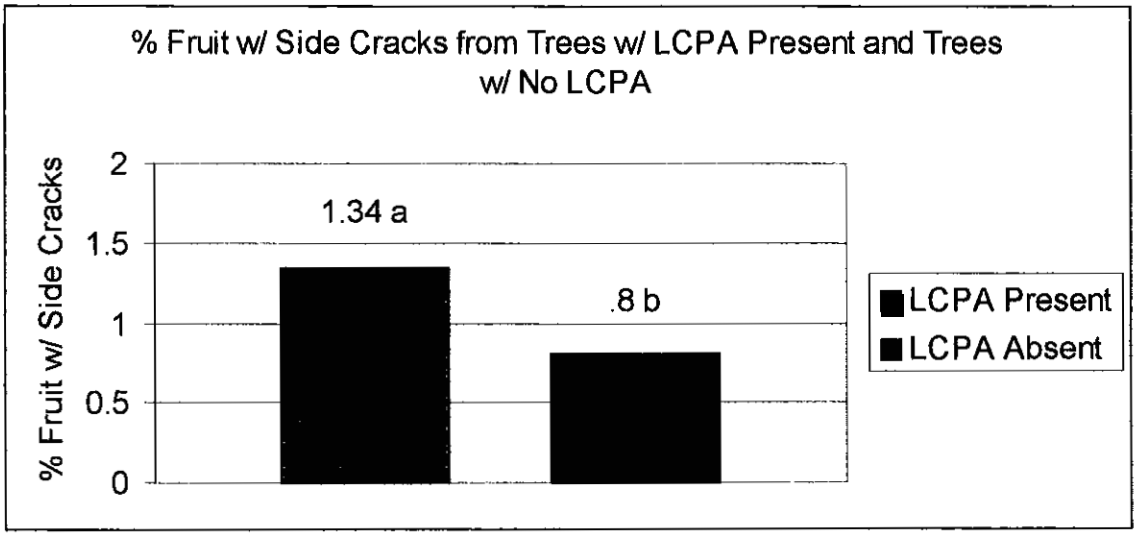
Spring Aphid and Monitoring:

The new monitoring technique, which involved looking at more trees and noting the presence or absence of aphids, was more reliable than the previous protocol. The 10 percent treatment threshold appears to be fairly accurate.

During the final evaluations, 1000 fruit were examined from trees which had been infested by prune aphids and 1000 fruit were examined from trees which had no prune aphid infestation (100 fruit from 10 different trees were examined for cracked fruit.) Trees with leaf curl plum aphids

present had significantly higher levels of side cracks present on fruit than trees without leaf curl plum aphids present (Graph 10). There was no significant difference in fruit cracking between trees with or without mealy plum aphids.

Graph 10.



Prune Rust Monitoring and Treatment Timing Recommendations:

Previous research (Teviotdale and Sibbett) has shown that post harvest defoliation from rust has no influence on fruit quality or productivity. In 1997 Olson, Krueger, and Teviotdale reported the appearance of rust infection on leaves has no influence on fruit soluble solids, dry away, size, etc.

Pre-harvest defoliation from rust has been reported to result in reduced fruit dry away and other fruit damage. The rust monitoring protocol appears to be a very good tool in timing and predicting needed treatments. None of the orchards monitored needed to be treated for rust and only one had any defoliation prior to harvest. In the Sacramento Valley, where rust is more prevalent, monitoring should be done weekly.

This monitoring technique is easy, accurate and takes little time. It accurately predicted that rust sprays were not needed this year. Many growers were aware of this through our e-mail and web site "Pest Updates". Had all Sacramento Valley prune orchards (where most of the prune rust is found) followed this predictive model, it would have saved the industry $1,920,000 in 1999 in unneeded preventative prune rust applications.

Presence-Absence Sequential Sampling for Webspinning Mites:

The presence- absence mite monitoring technique takes too long. To shorten the time required, monitoring will only take place every other week until mites are near the threshold and monitoring only 6 trees instead of 20 trees per site will be required. Only one of the four orchards that exceeded the threshold had any defoliation. This suggests that the treatment threshold may be adequate for prunes. Further evaluation of the treatment threshold will take place as more orchards with mites have defoliation.

Fertilization:

Based on critical mid summer leaf tissue levels a few sites had nitrogen and zinc levels below U.C. recommendations. The advisors involved at these sites will be working with their cooperators with fertilizer recommendations. Water samples did indicate several wells with significant levels of nitrate nitrogen in the water. This will be considered when making fertilizer recommendations. Some of these high nitrate- N levels may be the result of contamination due to fertigation. Advisors will be investigating if fertigation is involved and the extent that this practice could account for the nitrate nitrogen in the water.

Irrigation Scheduling:

Many grower cooperators were quite impressed with the irrigation-scheduling component of this project. Several growers found that they could apply fewer irrigation's than they had been used to applying. This will be reflected in lower electric bills and labor cost. One drawback to the monitoring technique is that it takes "decoding" and interpretation of the field data before an irrigation recommendation can be made. Next season we will attempt to use the following table which lists the suggested irrigation threshold values for midday stem water potential (bars) during the growing season for prunes. These values should be considered preliminary, but are based on research showing that levels of –15 bars by harvest will improve fruit drying ratio with no detrimental effects on yield or quality.

Suggested Threshold Values for Midday Stem Water Potential (bars) During the Growing Season for Prunes.

	Month						
Period	March	April	May	June	July	August	Sept.
Early-	-6	-8	-9	-10	-12	-13	-14
Mid-	-7	-8	-9	-11	-12	-13	-15
Late-	-7	-9	-10	-11	-12	-14	-15

ONFIT Procedure – Fruit Brown Rot Predictive Model:

The ONFIT procedure is a valuable tool to help determine the levels of fruit brown rot infection. Accurate prediction of brown rot levels at harvest can help determine the likelihood of economic loss and the necessity of preventative treatments.

Some latent infection levels indicated there would be higher fruit brown rot levels at the end of the season than was actually experienced. The discrepancy is probably due to difficulty in identifying brown rot in the laboratory. Training on identifying laboratory colonies will be important to correctly predict populations of brown rot on fruit at harvest.

Yield and Quality Evaluation:

The removal of the dormant insecticide and oil treatment, treatments for mites, rust, and aphids based on monitoring and treatment thresholds and irrigation scheduling based on leaf stem water potential had no visible adverse effects on productivity or fruit quality. Final grade sheets will

be used to verify these observations. Adjustments to the monitoring techniques and treatment thresholds are ongoing. Long term production and fruit quality impacts that occur as a result of these reduced-risk techniques will be measured over the next few seasons.

Education/Outreach:

Meetings to share information were numerous and well attended. In total over 830 people attended meetings that discussed the ESPS project in 1999. A wide spread popular article on the ESPS project was also published. The word is starting to get out about this project. Educational meetings are a vital part of this project and will continue. In 2000, all advisors are encouraged to use the insect day-degree equipment and report findings to interested clientele by electronic communication.

Securing Additional Grant Support:

The new grants secured will allow this project to expand to new sites and utilize new tools. We tentatively plan on reducing the number of comparison sites but increasing the number of demonstration sites. In total there will be more sites involved in the project in 2000. With the support of the California Prune Board and other sources of grant support, this work can continue to produce "reduced risk" pesticide and cultural options for prune producers.

New Directions in the ESPS Project:

- For next year the ESPS project will become more self reliant on advising growers on irrigation scheduling by using the irrigation scheduling table found in the conclusions.
- There will be fewer sites, which have a conventional. "reduced risk", and a check plot. But more sites demonstrating the "reduced risk" techniques researched.
- Pest Control Advisors (PCA's) will become more involved in the project by using the monitoring techniques in some demonstration plots.
- Some of the monitoring techniques will be modified to be more "PCA friendly."
- Possible inundative releases of *Harmonia axyridis* (multicolored Asiatic lady for aphid control.
- Begin trapping for leaf rollers to help improve monitoring protocol.

ESPS Protocol No. 3

Monitoring for P.T.B., Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling

(Under Evaluation)
Revised 7/28/99

Bill Olson, Carolyn Pickel, and Nadeem Shawareb

Purpose: Determine the need for "bloom time" and "in-season" applications of *Bacillus thuringiensis* (Bt) to control over wintering Peach Twig Borer Larvae and Leafroller Larvae. Several species of leaf roller are difficult to identify in the field such as fruit tree leafroller and oblique-banded leafroller. Other larvae that should be counted in this category are canker worm, green fruit worm, and rarely omnivorous leafroller.

Monitoring Timing: Bloom Time- Monitoring for blossom feeding should start when flowers are nearly at "popcorn stage" and continued weekly until the end of April.

In-season- Start monitoring for leaf rollers in mid June. Monitor each orchard weekly until August.

Method: Bloom time- Randomly sample 50 trees minimum for each plot (Conventional, ESPS, and Check plot). DO NOT sample the same trees each week. Inspect 10 shoots per tree by reaching up from ground. Shoots and blossoms do not need to be picked from the tree. If you suspect there is larvae or damage present then pick the blossom/shoot tip for a closer examination. Sample around the tree. Record the number of damage sites from larval feeding or, if present, larvae for each tree.

In-season- Visually inspect 80 trees per plot by walking around trees and looking for larvae or larval damage. (These can be the same trees as used in the aphid protocol). Be sure to look in areas where fruit are touching and where fruit are touching leaves. Record the number of larvae found or larval damage sites for each tree. Also record the type of damage: (rolled leaves and webbing; hole in shoot; scar on fruit or hole in fruit).

Treatment Threshold: Bloom time-If a total of more than 25 shoots (5%) have larvae present or are damaged and have some larvae (PTB or leafroller) present, a treatment is recommended. For fresh prunes, 1 % is the treatment threshold.

In-season- If more than 4 trees of the 80 (5%) have evidence of larvae or larval damage and have some larvae present a treatment is recommended. For fresh prunes, 1 % is the treatment threshold.

Orchard History: If last years crop had significant P.T.B. or leafroller damage, bloom time B.t. treatments are recommended regardless of monitoring levels. However, monitoring is still encouraged to further refine technique and treatment thresholds.

Treatment Timing and Rates: If populations exceed the treatment threshold, treatment should be made during bloom with *B.t.*and as soon as possible in-season. See Pest Management Guidelines for recommendations.

Note: Record the amount of time it took to sample for cost analysis.

CALIFORNIA PRUNE NEWS

IPFP

No. 112 November 1999

INTEGRATED PRUNE FARMING PRACTICES

This Integrated Prune Farming Practices (IPFP) Newsletter is supported by grants to the California Prune Board from CalEPA/DPR, UC/SAREP and USDA/CSREES. The purpose of this quarterly newsletter is to keep you informed regarding progress of the IPFP Project. We encourage comments and suggestions on the newsletter. Our aim is to better serve you, the prune grower.

IPM INNOVATOR AWARDS

SACRAMENTO - Putting "green" tactics to work on famous fairways. Creating wildlife habitat in vineyards. Cleaning up urban creeks. Introducing natural pest control in orchards. These and others success stories for nature-friendly pest control earned 1999 IPM Innovator awards on November 4, 1999 from Cal/EPA's Department of Pesticide Regulation.

Cal/EPA Secretary Winston H. Hickox and DPR Director Paul E. Helliker presented Innovator awards at ceremonies in the Governor's Council Room at the State Capitol. IPM - integrated pest management - works with the environment to make it difficult for pests to survive, while encouraging beneficial organisms to flourish. IPM Innovator awards recognize organizations that pioneer least-toxic approaches to pest control and then help others do the same.

Hickox commended the Innovators. "As Cal/EPA Secretary, I am committed to being a strong advocate for the environment. So I am especially pleased to present awards to others who share that deep commitment. Their contribution to enhancing California's environmental quality has been exceptional".

DPR Director Paul E. Helliker also praised the recipients. "People talk about the Silicon Valley as the heart of California's innovative spirit", said DPR Director Paul E. Helliker. "However, they have a ways to go to match the pioneering spirit of California's farmers, who lead the nation in environmental innovation."

"These agricultural innovators believe that they can make a difference - and they have," Helliker said. "Through laborious and costly trial-and-error, over many growing seasons, they developed new ways to fight age-old pests, with the goal of protecting both the environment and their financial future."

"And then, contrary to what business-school textbooks tell you about getting ahead, these innovators shared their solutions with others in the belief that protecting the environment doesn't stop at your own property line," Helliker said.

Among the IPM Innovator award winners was the California Prune Board, Pleasanton, a state marketing order representing California's prune growers and packers which has supported prune IPM research for 20 years. The Board was an original supporter of the Biological Prune Systems (BPS) project, initiated in 1996. BPS growers experimented with cover crops, hedgerow plantings and vegetative buffer strips, and eliminated the use of diazinon as a dormant spray by the project's third year. In 1998 the Board assumed management of BPS and began supporting the University of California Environmentally Sound Prune Systems project, patterned after BPS, but with a UC research focus. Currently, the Board oversees both projects under the Prune Pest Management Alliance. There are 22 demonstration orchards in the two projects, comparing conventional and reduced-risk programs. The Board provides information on reduced-risk practices at grower field days and through newsletters. Media contact: Gary Obenauf (559) 447-2127.

Richard Peterson Accepting Award From Secretary Hickox and Director Helliker

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PARTICIPANTS

The IPFP project also includes many other individuals who have been involved in prune research and demonstration projects in the past and have made a commitment to the project. It is anticipated the list will change during the project. Listed below are most of the participants, in addition to the Management Team, who have committed to the project to date:

UC FARM ADVISORS:

- **Bill Olson,** Butte County
- **Carolyn Pickel,** IPM Advisor
- **Walt Bentley,** IPM Advisor
- **Mark Freeman,** Fresno County
- **Rick Buchner,** Tehama County
- **Bill Krueger,** Glenn County
- **Maxwell Norton,** Merced County
- **Tim Prather,** IPM Advisor
- **Wilbur Reil,** Yolo County
- **Steven Sibbett,** Tulare County
- **Brent Holtz,** Madera County

UC COOPERATIVE EXTENSION SPECIALISTS:

- **Steve Southwick,** Pomology Specialist
- **Clyde Elmore,** Weed Science Specialist
- **Beth Teviotdale,** Plant Pathology Specialist
- **Becky Westerdahl,** Nematology Specialist

UC EXPERIMENT STATION:

- **Ted DeJong,** Pomologist
- **Bruce Kirkpatrick,** Plant Pathologist
- **Themis Michailides,** Plant Pathologist
- **Nick Mills,** Entomologist
- **Ken Shackle,** Pomologist
- **Jim Thompson,** Agricultural Engineer
- **Barry Wilson,** Toxicologist

OTHERS:

- **CPB Research Subcommittee**
- **Prune Growers,** Grower Cooperators in the field demonstration/research plots (23 to date)
- **Bob Elliott,** CalEPA/DPR/PMA
- **Jenny Broome,** UC/SAREP/BIFS
- **Dawit Zeleke,** The Nature Conservancy

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IPFP Sites
Progress Report December 1999

1. BIFS, Onstott Orchards, Butte County

The Onstott site was able to get to harvest without any significant problems this quarter. The levels of PTB and Leafrollers was monitored through July and although they never reached a treatable level the ranch manager will be sure to treat with Bt at bloom every year. There were a few web spinning mites that appeared along the road edges and the predators have kept them under control.

Rust had not appeared by harvest in the middle of August. The grower as a preventative program did apply sulfur in early July to the entire block including the Check block. His reasoning for treating about half of all the prunes with sulfur was that if there was an outbreak of Rust he could would be able to treat the other half in time. In hind sight, he said, 'We did not apply any pesticides to the block except bloom time fungicide and that sulfur spray, and I guess we didn't even need to put on the sulfur. The block will be evaluated in mid September for a final rust evaluation.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique' (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by *Monilinia fruticola* or *Monilinia laxa*. This technique showed a 4 % infection of Brown Rot which was below the treatable level of 5 %. At the harvest monitoring, however, there was no Brown Rot observed from the 2,000 fruit checked.

The pressure bombing technique of monitoring tree stress was conducted weekly through this quarter up until harvest. Thereafter a post harvest reading and another reading after the irrigation will be taken. Because the orchard has a flood system, the grower has not tried to stress the trees with the information of the pressure bomb readings.

The fruit was also checked for the final harvest evaluations for worm damage and there was very little worm damage on the trees at harvest. There were 5 trees that were checked for aphid damage and these seemed to have more side cracks, but they were also all outside row trees, so it is difficult to say the cause of the cracks.

No aphids were found at either the early or late monitoring at Onstott Orchards. For the 5 years that this site has been managed without any pesticides applied other than oil and Bt with the bloomtime fungicide, there has never been an aphid problem. There were three trees with MPA last summer but they did not spread. Of more importance the presence of PTB and OBLR larvae that feed on the buds and fruit appears to be a pest of concern.

Dormant spur samples will be taken and compared to last years sample where 25 % had San Jose Scale (SJS) and 7 % were parasitized. There was an abundance of SJS parasites caught in phermone traps in 1999. This long term 30 acre block is also the location of side by side 15 acre in cover crop versus resident vegetation; yellow foxtail, bermudagrass, and johnsongrass, to improve water infiltration.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole years, use the sections below by marking the month that a pest is typically controlled, and the pesticide or control method used and primary target).

J F M A M J J A S O N D

Insect:
- PTB — Diazinon (4lb) + 0.1 (4gal)
- Mites — Carazol or Vendex

Disease:
- Brown Rot — Rovral and Oil, Break
- Scab — Captan
- Rust Sulpher

Weed:
- Strips — Roundup, Surflan, Goal

Nematode:

Vertebrate:

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests although there were 8 % SJS and 2 % parasitization.

Reduced risk block: Our dormant spur sample indicated SJS was above the 10% treatment threshold at 26 %, however the parasitization rate was 7 % and no spray was applied.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied had an almost no effect compared with the unsprayed and counts of worms in the spring were sometimes higher in the sprayed block.

Reduced risk block: This was the first year that this was not sprayed with BT and the worms were beyond the treatment threshold several times during the season. Populations were not acceptable for fresh pick.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold, but a preventative spray was applied to the entire block.

Reduced risk block: Sampling did not indicate a population above the threshold, but a preventative spray of sulfur was applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 1% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 3 (Asana, BR Bloom, Sulfur)

Reduced risk block: 2 (BR Bloom, Sulfur)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .2% worm, 0% brown rot, 0% fruit with scale. 0% defoliation from rust, 0% defoliation from mites

Reduced risk block: 0% worm, 0% brown rot, 0% fruit with scale, 0% defoliation from rust, 0% defoliation from mites

IRRIGATION SCHEDULING

Our records show that you applied 4 irrigation during the 1999 growing season.

2. ESPS, Brad Johnson,Gridley, Butte County

Over wintering San Jose scale levels in Brad's orchard were 10 % with 0 % parasitism and did not exceed the 10 % treatment threshold. Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plots were not treated for scale. The ESPS plot was not treated during dormancy for over wintering aphid eggs based on results of ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations). Mealy plum aphid was found in this fall sampling but only on 5 % of the trees (below the threshold set for applying preventative dormant treatment).

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 65, 4, and 118, respectively. Prospatella wasps were caught in all of the test plots: 77 in the ESPS, 152 in the conventional and 286 in the check. Male scale catches totaled 338 in the ESPS plot, 110 in the conventional, and 142 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 963, 381, and 309, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence exceeded the 5% treatment threshold in the ESPS and the check plot. The highest level of damage from any one sampling period was 13.75 % in the ESPS plot, 5.0 % in the conventional, and 13.75 % in the untreated check. Some larvae larvae were found to be attacking fruit. The

larvae recovered were peach twig borer, oblique banded leafroller, oriental fruit moth and codling moth with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.
The ESPS and the check plot had leaf curl plum aphid present on 11 % and 39 % of the trees, respectively. Large numbers of parasitized leaf curl plum aphids (mummies) were present. No treatment was recommended for leaf curl plum aphid. Approximately 43.75 % of the trees in the ESPS and 84 % of the trees in the check were infested with mealy plum aphid. No mealy plum aphid or leaf curl plum aphids were present in the conventional plot. Trees infested by mealy plum aphid were used to conduct a replicated experiment using insecticide oil and other "soft" materials. Treatments were applied at a 200 GPA volume using a backpack "air blast" sprayer. Results of this experiment will be included in the final report. Additionally, mealy plum aphid parasitoids were released by Dr. Nick Mills in Brad's orchard. No other in-season treatments were applied to any of the test plots for prune aphids.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. No rust has been found in any of the test plots. No treatments for prune rust were recommended or applied to any of the test plots.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 51 %, 36.6 %, and 62 %, respectively. The percentage of leaves with web spinning mites present did not exceed 54 % in the ESPS, 13 % in the Conventional, and 62 % in the check during any given sampling period. Mite populations exceeded the 53 % treatment threshold in the ESPS and the check plot. Although mite predators were present in large numbers, mite damage in these two plots was severe enough to cause bronzing of the leaves and some defoliation. Defoliation was most severe in trees that had heavy mealy plum aphid infestations earlier in the season. The majority of the mite infestation occurred in north part of the orchard. The first ten rows on the north side of each plot was treated with Kelthane on July 24, totaling approximately 3.5 acres.
A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. One percent of the fruit evaluated using the ONFIT procedure was infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10

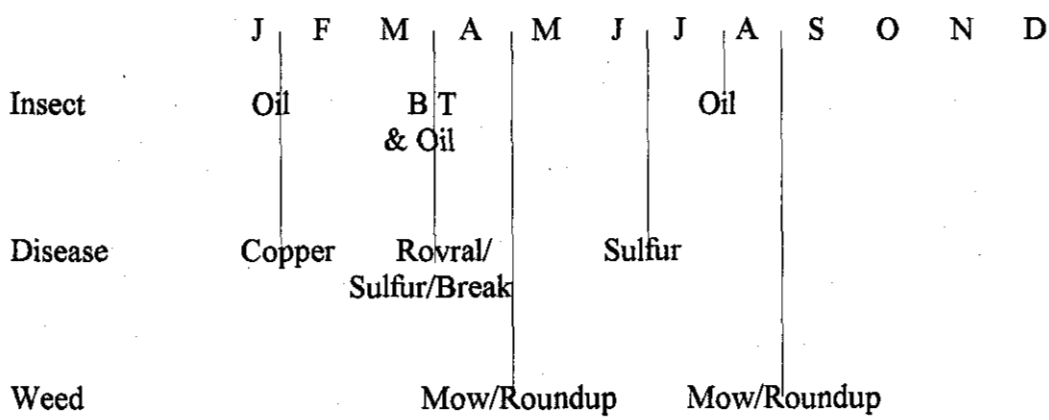
fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.
In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 1.8 % worm damage in the ESPS, .6 % in the Conventional, and 2.0 % in the Untreated Check. The percentage of fruit with San Jose scale present was 6.2 % in the ESPS, 0 % in the Conventional, and 6.6 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust. Although high populations of web spinning mites caused some defoliation earlier in the season, an application of Kelthane reduced the mites to acceptable levels and prevented further defoliation. No fruit brown rot was observed in any of the three test plots.

Trees with mealy plum aphids present had side cracks on 2.7 % of the fruit and end cracks on 6.1 % of the fruit. Trees with no aphids present had side cracks on 3.1 % of the fruit and end cracks on 2.8 % of the fruit.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would be some prune aphids present the following spring. No treatment was recommended. Mealy plum aphid was present on 44 % of the trees and leaf curl plum aphid was present on 11% of the trees.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS did not exceed the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations were made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 1% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2 (Asana + oil) and fungicide at "bloom time"

Reduced risk block: 1 fungicide at "bloom time"

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .6% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: 1.8% worm, 0% brown rot, 6.2% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Butte-BJ	Conv.	2.268	2.27	44	178
Butte-BJ	ESPS	2.153	2.22	44	160

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.2	0.67	2.5	4.5	0.9	<1	0.2	<0.1	10.5	29.2

IRRIGATION SCHEDULING

Our records show that you applied 4 irrigations to the ESPS plot during the 1999 growing season.

3. CSREES, California State University Farm, Butte County

No over wintering San Jose scale or parasitized scale were found in the dormant spur samples in the CSUC orchard. Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plot were not treated for scale. The ESPS plot was treated with oil at dormancy to kill over wintering aphid eggs based on results of ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations).

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 1, 1, and 3, respectively. Prospatella wasps were caught in large number in all three test plots: 433 in the ESPS, 395 in the conventional and 260 in the check. Male scale catches totaled 4 in the ESPS plot, 5 in the conventional, and 5 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 1108, 810, and 1265, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 12.5 % in the ESPS plot, 17.5 % in the conventional, and 13.75 % in the untreated check. Although a significant number of shoot tips were damaged by larval feeding, only a few live larvae were recovered from damaged shoot tips and virtually no larvae were found to be attacking fruit. The larvae recovered were peach twig borer and oblique banded leafroller with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.

There has been no prune aphid infestation in any of the three test plots in the CSUC orchard.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will

take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. No rust has been found and no treatments for prune rust were recommended or applied to any of the test plots.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 11.1% in the ESPS, 12.2 % in the Conventional, and 3.3 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 53.3 %, 42.2 %, and 47.7 %, respectively.

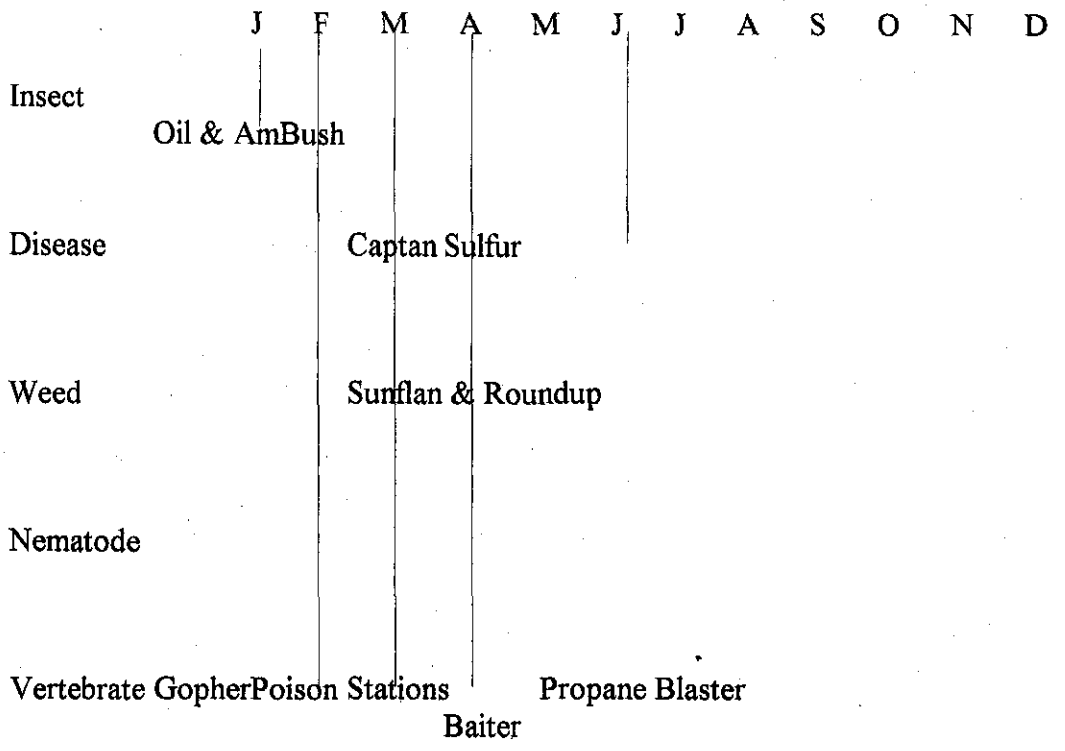
A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.
In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 1 % worm damage in the ESPS, .8 % in the Conventional, and 1.8 % in the Untreated Check. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. Fruit brown rot was present on .2 % of the fruit in the ESPS plot, 0 % in the Conventional and 0% in the Untreated Check.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would be prune aphids present the following spring. An application of insecticide oil was recommended. No prune aphids were present in season.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations were made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2 (Asana + oil) and fungicide at "bloom time"

Reduced risk block: 2 (oil) and fungicide at "bloom time"

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .8% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: 1.0% worm, .2% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Butte-CSUC	Overall	2.632	3.15	66	27

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.4	0.34	1.6	1.7	0.4	<1	<0.1	0.1	5.71	15.9

IRRIGATION SCHEDULING

Our records show that you applied 5 irrigations to the ESPS plot and 9 irrigations to the conventional plot during the 1999 growing season.

4. BIFS, Shasta View Farms, Tehama County

The Fall Aphid sampling at the Shasta View was done twice to validate an early versus late sampling strategy. At both the October 7 and the November 16 date no aphids were found. Last year there was a slight outbreak along the north corner of the block.

Shasta View Farms is managed by Brendon Flynn, Pacific Farms, who also has another ESPS site south of Red Bluff and a walnut PMA site. After discussion with Brendon and Rick Buchner, UCCE Farm Advisor for Tehama County, it was decided to discontinue this site as Pacific Farms doesn't need two ESPS sites.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole years, use the sections below by marking the month that a pest is typically controlled, and the pesticide or control method used and primary target).

J F M A M J J A S O N D

Insect:	Mites	
	PTB	Asana, Oil
Disease:	Brown Rot	Rovral & Oil (4gal)
	Scab	Captan
Weed:	Strips	Roundup, Solicam, Surflan
Nematode:		
Vertebrate:	Gophers	Mechanical Bait

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified. Never the less an outbreak in the northwest corner of LCPA did occur. The in season Asana and oil treatment applied effectively controlled the LCPA.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10 % level with only 2 % SJS and 2 parasistized scale and no spray was recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatment recommendation was made.

FRUIT BROWN ROT

Entire Orchard: Sampling in the block indicated a problem at 5 % and a treatment was made.

Check Block: No treatment resulting in more Brown Rot, 0.85% by handsample.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS
Conventional block: 3 (Asana & Oil, Brown Rot Bloom, Brown Rot Fruit)
Reduced risk block: 3 (Brown Rot Bloom, Asana & Oil, Brown Rot Fruit)
HARVEST TIME FRUIT AND TREE EVALUATIONS
Conventional block: .2% worm, 0.35% brown rot, 0% fruit with scale. 0% defoliation from rust, 0% defoliation from mites
Reduced risk block: .2.2% worm, 0% brown rot, 2.4% fruit with scale, 0% defoliation from rust, 0% defoliation from mites
IRRIGATION SCHEDULING
Our records show that you applied 5 irrigations during the 1999 growing season.

5. ESPS, Vina Monastary, Tehama County

No over wintering San Jose scale was found in any of the Vina Monastary test plots. Asana + oil was applied to the conventional plot during dormancy while the ESPS and check were left untreated. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphids.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 1, 1, and 1, respectively. Prospatella wasps were caught in all three plots: 48 in the ESPS, 22 in the conventional, and 37 in the check. Male scale catches totaled zero in the ESPS plot, 1 in the conventional, and zero in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 268, 189, and 286, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

No larval damage or larval presence was observed in any of the test plots.

Low levels of leaf curl plum aphid infestation occurred in the ESPS and check plots in early April. Both plots had aphid infestation on 1.25 % of the trees. No mealy plum aphids were present in any of the test plots.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Grower who decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust has not been found in the Vina Monastary orchard thus far.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 12 % in the ESPS, 6.7 % in the Conventional, and 33 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no

miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 23.3 %, 30 %, and 30.7 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed .4 % worm damage in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would not be prune aphids present the following spring. No treatment was recommended.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS did not exceed the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations were made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 3 (Asana + oil) 2 fungicide applications (Vanguard-Bloom and sulfur for prune rust).

Reduced risk block: 1 (bloom time fungicide-Rovral + oil)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: .4% worm, 0% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Tehama-M	Conv.	2.38	2.89	73	263
Tehama-M	ESPS	2.59	2.49	73	26

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7	0.15	0.5	0.5	0.5	1	0.1	0.1	0.09	0.3

IRRIGATION SCHEDULING

Our records show that you applied 3 irrigations to the ESPS plot during the 1999 growing season.

6. CSREES, Red Bluff Farms, Tehama County

No over wintering San Jose scale was found in any of the Red Bluff Farms test plots. Asana + oil was applied to the conventional plot during dormancy while the ESPS

and check were left untreated. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphids.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 3, 2, and 5, respectively. Prospatella wasps were caught in all three plots: 128 in the ESPS, 43 in the conventional, and 30 in the check. Male scale catches totaled 6 in the ESPS plot, 4 in the conventional, and zero in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 273, 219, and 335, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

Larval damage or larval presence was below the 5 % treatment threshold in the three test plots. The highest level of damage from any one sampling period was 1.25 % in the ESPS plot, .25 % in the conventional, and .5 % in the untreated check. Damage to shoot tips was caused by leaf rollers.

Significant leaf curl plum aphid infestation occurred in the ESPS and check plots in early April. The ESPS plot had infestation on 24 % of the trees, .08 % in the conventional, and 71 % in the check. The ESPS and the check plot were treated with diazinon on May 4th. No mealy plum aphids were present in any of the test plots.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Grower who decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust has not been found in the Red Bluff Farms orchard thus far.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 12 % in the ESPS, 3.3 % in the Conventional, and 5 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 25 %, 23 %, and 33 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot

infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 0 % worm damage in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Trees with leaf curl plum aphids present had side cracks on 2.1 % of the fruit and end cracks on 2.4 % of the fruit. Trees with no aphids present had side cracks on 1.7 % of the fruit and end cracks on 3.3 % of the fruit.

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would not be prune aphids present the following spring. No treatment was recommended. Approximately 25 % of the trees had leaf curl plum aphid present in the spring. A Diazinon application on May 4th controlled the leaf curl plum aphids.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS did not exceed the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations were made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 3 (Asana + oil, Vanguard fungicide application at bloom, and sulfur treatment for prune rust)

Reduced risk block: 2 (rovral + oil, diazinon in season for leaf curl plum aphids)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: 0% worm, 0% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Tehama-RB	Conv.	2.518	3.29	102	194
Tehama-RB	ESPS	2.684	3.42	106	231

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
6.8	0.6	1.1	1.5	3.2	3	2.5	1.4	2.11	5.9

IRRIGATION SCHEDULING

Our records show that you applied 6 inseason irrigations to the ESPS plot during the 1999 growing season plus 1 postharvest.

7. PMA, Farmland Management, Tehama County

The Farmland Management site suffered freeze damage and did not have a crop on the part of the orchard that was the plot. The orchard was monitored for levels of PTB and Leafrollers through July but never reached a treatable level. Even though there have been a few webspinning mites appear along the road edges the predators have kept them under control and they have not moved into the orchard.

The farm manager treated the orchard with sulfur in anticipation of problems with Rust, but the Rust never appeared by mid August. A September evaluation of Rust will be done after the normal irrigation as a final evaluation.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique' (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by *Monilinia fruticola* or *Monilinia laxa*. This technique showed a 2 % infection of Brown Rot which was below the treatable level of 5%. Since there is not a crop the grower would not treat even if the ONFIT method did show a treatable level of Brown Rot. In the final evaluations of the fruit at harvest there was no Brown Rot recorded.

The pressure bombing technique of monitoring tree stress was conducted weekly through this quarter up until a normal harvest timing. The orchard has a drip system that is marginal at the farthest end from the pump. For this reason the grower has not tried to stress the trees with the information of the pressure bomb readings. His current program even without a crop is to irrigate daily, and he did not want to change this because he felt that he wanted to keep the foliage flush and the trees growing strongly. His comments about deficit irrigation included, 'If we want to make big prunes, we need to keep them well watered without any stress.'

The fruit was evaluated for the final harvest and there was again less than 1 % worm damage and there was not any correlation to the aphids on the LCPA trees.

The Farmland Management site has been planted to native shrubs along the border and planted with Yarrow throughout the BPS block. An abundance of predatory wasps, hover flies, minute pirate bugs, and other generalist predators can be seen on the shrubs.

This orchard froze last year but a small crop of large prunes was harvested any way. Farmland Management, run by David Evers, has been the site of Leaf Curl Plum Aphid for the past 4 years. The site was double sampled as were all the plots. There were no aphids found by the field scout either time.

Farmland Management's orchard is the oldest in the BPS project. An alternate row cover crop of annual clovers, rose, crimson, burr, and sub was planted 5 years ago. David Evers, the farmer representative to the BPS Team, has used this site to plant a hedgerow; 1 and 2 year old examples of buckwheat, yarrow, coyote brush, coffeeberry, deergrass, and native perennial grasses. The past year we planted yarrow throughout the soft block on the orchard berms for beneficial insect habitat. This winter we will again plant out more hedgerows along the road and finish planting the yarrow in the orchard.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole years, use the sections below by marking the month that a pest is typically controlled, and the pesticide or control method used and primary target).

J F M A M J J A S O N D

Insect:	Aphids	Asana and Oil
	PTB	Supracide and Oil
	Mites	
Disease:	Brown Rot	Vanguard
	Scab	
Weed:	Strips	Roundup, Surflan, and Goal
Nematode:		
Vertebrate:	Squirrels	

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified however there were a few aphids along the corner that did not need spraying.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no spray was applied for SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment appeared to not be effective with the hand samples in the spring often being twice what the reduced risk block was but this could be related to the light crop.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold but a preventative spray of sulfur was applied.

Reduced risk block: Sampling did not indicate a population above the threshold but a preventative spray of sulfur was applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 2% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 3 (Asana & Oil, Brown Rot Bloom, Sulfur)

Reduced risk block: 2 (Brown Rot Bloom, Sulfur)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .1.6% worm, 0% brown rot, 0% fruit with scale. 0% defoliation from rust, 0% defoliation from mites

Reduced risk block: 2.2% worm, 0% brown rot, 2.4% fruit with scale, 0% defoliation from rust, 0% defoliation from mites

IRRIGATION SCHEDULING

Our records show that you applied weekly irrigations during the 1999 growing season.

8. BIFS, Thiara Ranches, Sutter County

The Thiara site along with the Billiou site had considerable pest problems this season. The levels of PTB and Leafrollers was monitored through July but never reached a treatable level. The trap counts were very low all season although shoot strikes were evident. This orchard is surrounded by peaches that are on a mating disruption program and this seems to have depressed the trap counts.

The mealy plum aphids at this site continued to be present all season even up to harvest. The grower was encouraged to treat all but the Check block with Asana in May to prevent an aphid problem and even though he said that this was done, the aphids were not even partially controlled. They continued to be a source of concern through July. The webspinning mites appeared to be growing to a problem level through July, but through the Presence/Absence technique of evaluation a treatment was never recommended as the predators were sufficient to keep them from becoming damaging. Rust had not appeared by harvest in the middle of August and no treatments were applied as a preventative. A final mid September evaluation of both mites and rust will be done. A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique' (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by *Monilinia fruticola* or *Monilinia laxa*. This technique showed a 6 % infection from the ONFIT technique which was slightly over the 5 % threshold. The grower did not treat and there wasn't any observable Brown Rot in the 2,000 fruit that was checked.

The pressure bombing technique of monitoring tree stress was conducted weekly through this quarter up until harvest. Thereafter a post harvest reading and another reading after the irrigation will be taken. Because the orchard has a border check flood system, the grower has not tried to stress the trees with the information of the pressure bomb readings, but the trees seemed to be more stressed that was necessary by this irrigation method.

The fruit was checked for the final harvest evaluations for worm damage and there was very little damage in any of the plots, once again probably due to the mating disruption in the neighboring peaches. This site also had considerable MPA presence and it also had considerable cracking of both end and side cracks compared to other blocks, but it did not seem to be related to the aphids and may have been more influenced by the border check irrigation system.

The Thiara Ranches site was removed this year as it had many portions that were old and unproductive with the border/check irrigation system. A new site at Pennington and Riviera Roads of older trees was established and no aphids were found during the November sampling. This is next to a peach pheromone disruption system and J. R. Thiara would like to farm all of his crops with soft methods.

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have aphids but we elected to not spray. As a consequence we applied Asana and oil in season and in hindsight should have tried oil at 5 gal. MPA aphids continues to infest the orchard throughout the season.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was above the 10% threshold at 12% with 1% parasistization, but no treatment was applied.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended. There were almost no trap catches probably due to the pheromone disruption system in the three surrounding peach orchards.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatment recommendation was made.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 6% of the fruit would be infected with brown rot at harvest nevertheless no treatment was made and the harvest sample showed 0 % Brown Rot indicating a sampling problem.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2

Reduced risk block: 2

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0% worm, 0% brown rot, 0% fruit with scale. 0% defoliation from rust, 0% defoliation from mites

Reduced risk block: 0.4% worm, 0% brown rot, 0 fruit with scale, 0% defoliation from rust, 0% defoliation from mites

IRRIGATION SCHEDULING

Our records show that you applied 4 irrigations during the 1999 season.

9. PMA, David Crane, Live Oak, Sutter County

Over wintering San Jose scale levels in David's orchard were 8 % with 1 % parasitism (below the 10 % treatment threshold). Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plots were not treated for scale. The ESPS plot was treated with oil at bloom to kill over wintering aphid eggs based on results of ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations).

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 5, 9, and 5, respectively. Prospatella wasps were caught in all of the test plots: 89 in the ESPS, 80 in the conventional and 82 in the check. Male scale catches totaled 1 in the ESPS plot, 17 in the conventional, and 11 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 214, 159, and 304, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the ESPS plot. The highest level of damage from any one sampling period was 13.75 % in the ESPS plot, 5.0 % in the conventional, and 3.75 % in the untreated check. Although a significant number of shoot tips were damaged by larval feeding, only a few live larvae were recovered from damaged shoot tips and virtually no larvae were found to be attacking fruit. The larvae recovered were peach twig borer and oblique banded leafroller with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.

The ESPS and the check plot had leaf curl plum aphid present on 23.75 % and 21.25 % of the trees, respectively. Approximately 3.75 % of the trees in the ESPS and 60 % of the trees in the check were infested with mealy plum aphid. No mealy plum aphid or leaf curl plum aphids were present in the conventional plot. No in-season treatments were applied to any of the test plots for prune aphids.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust began to appear in David's orchard in early August. The percentage of trees with rust was 12.5 % in the ESPS, 5 % in the Conventional, and 2.5 % in the Check plot. With harvest only two weeks away, there was not a high risk of significant pre-harvest defoliation occurring. No treatments for prune rust were recommended or applied to any of the test plots.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 20 % in the ESPS, 6.25 % in the Conventional, and 20 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 51 %, 36.6 %, and 62 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

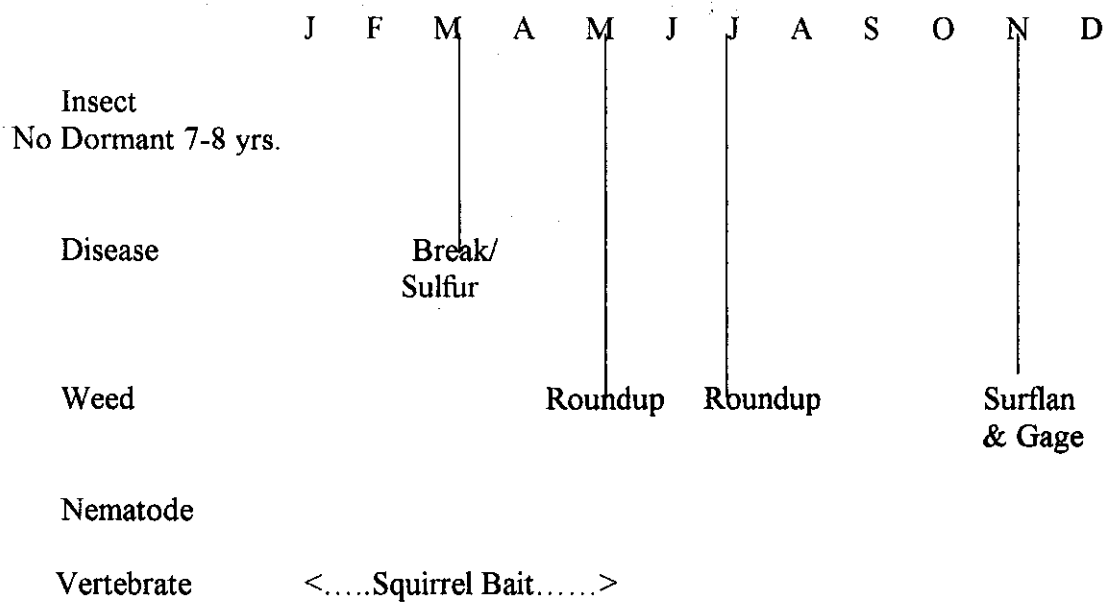
Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.
In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 0 % worm damage in the ESPS, .2 % in the Conventional, and .2 % in the Untreated Check. The percentage of fruit with San Jose scale present was .4 % in the ESPS, 0 % in the Conventional, and 1.8 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Trees with mealy plum aphids present had side cracks on 1.7 % of the fruit and end cracks on 4.8 % of the fruit. Trees with no aphids present had side cracks on 3.5 % of the fruit and end cracks on 2.4 % of the fruit.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would be prune aphids present the following spring. An application of insecticide oil was recommended and applied at "green tip". This kept mealy plum aphid populations below the (in season) treatment threshold.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations were made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2 (Asana + oil at dormancy and Break at "green tip)

Reduced risk block: 1 (Break + oil at "green tip")

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .2% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: 0% worm, .2% brown rot, .4% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Sutter-DC	Overall	2.284	2.25	48	18

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.2	0.24	0.8	1.4	0.5	<1	0.1	<0.1	1.3	3.6

IRRIGATION SCHEDULING

Our records show that you applied 7 irrigations to the ESPS plot during the 1999 growing season.

10. ESPS, John Heier, Sutter Buttes, Sutter County

Over wintering San Jose scale levels in John's orchard were at 8 % with 1 % parasitism (below the 10 % treatment threshold). Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plot were not treated for scale. The ESPS plot was treated with oil for mealy plum aphid during delayed dormancy based on results of ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations).

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. No San Jose scale or parasitoids were caught in the pheromone traps in any of the test plots.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 442, 856, and 839, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex,

and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

Larval damage or larval presence was below the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was .25 % in the ESPS plot, 0 % in the conventional, and .25 % in the untreated check. Damage to shoot tips was caused by leafroller.

There was no aphid infestation in the conventional plot until early July when mealy plum aphid began to migrate from the ESPS block. The conventional block has had 2.5 % of the trees infested with mealy plum aphids. While the ESPS and the check plot have had infestation by both leaf curl plum aphid and mealy plum aphid, only mealy plum aphid has exceeded the 10 % treatment threshold. Random sampling in has indicated that 89 % of the trees in the ESPS plot and 98 % of the trees in the check plot were infested by mealy plum aphid. Although application of insecticide oil was recommended immediately after the treatment threshold was exceeded, fruit phytotoxicity from an oil application is a major concern for John Heier since the majority of his prune crop is sold for fresh market. No treatments have been applied thus far.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Grower who decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust has not been found in John's orchard thus far.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 3.3 % in the ESPS, 2.2 % in the Conventional, and 6.6 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 19 %, 10 %, and 22 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed .2 % worm damage in the ESPS, 0 % in the Conventional, and .8 % in the Untreated Check. The percentage of fruit with San Jose scale present was 5.0 % in the ESPS, .4 % in the Conventional, and 10.4 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. The percentage of fruit with European fruit lecanium present (brown apricot scale) was 1.2 % in the ESPS, 0 % in the Conventional, and .6 % in the Untreated Check. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Trees with mealy plum aphids present had side cracks on 1 % of the fruit and end cracks on 29.4 % of the fruit. Trees with no aphids present had side cracks on .5 % of the fruit and end cracks on 5.7 % of the fruit.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).

	J	F	M	A	M	J	J	A	S	O	N	D
Insect												
Disease			Captan Break									
Weed		Roundup			Roundup							
Nematode												
Vertebrate												

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have a high level of prune aphids present in the spring. Application of oil at dormancy did not adequately

control prune aphids. Sampling showed that 89% of the trees in the ESPS plot had mealy plum aphids present.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no treatment was recommended to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records that no fungicides were applied.

Reduced risk block: Sampling did not indicate a population above the threshold, no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE AND FUNGICIDE APPLICATIONS

Conventional block: 2 Total - Asana + Oil dormant, 1 "bloom" fungicide.

Reduced risk block: 2 Total – Oil at dormancy, 1 bloom fungicide.

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0% worm, 0% brown rot, .4% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites.

Reduced risk block: .2% worm, 0% brown rot, 5.0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites.

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Sutter-JH	Overall	2.389	2.25	45	16

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.2	0.34	1.1	1.5	0.8	1	0.3	0.1	5.9	16.4

11. PMA, Monte Johnson, Live Oak, Sutter County

Monte's orchard had a high level of over wintering San Jose scale (40 % and 1 % parasitized scale). Asana + oil was applied to the conventional plot during dormancy while oil alone was applied to the ESPS plot for the suppression of over wintering scale. The check was not treated for scale. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphid control.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Encarsia (Prospatella). Traps were monitored until the end of the over wintering generation. Aphytis wasps were caught in pheromone traps in the ESPS, Conventional, and Check plots. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 3, 5, and 4, respectively. While Encarsia wasps were caught in higher numbers in than Aphytis, Encarsia was recovered only from the ESPS and the check plots; there were 15 and 21 respectively. Male scale catches totaled 1 in the ESPS plot, zero in the conventional, and 2 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 334, 200, and 346, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 11.25 % in the ESPS plot, 11.25 % in the conventional, and 15 % in the untreated check. Although a significant number of shoot tips were damaged by larval feeding, only a few live larvae were recovered from damaged shoot tips and virtually no larvae were found to be attacking fruit. The larvae recovered were peach twig borer and oblique banded leafroller with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.

There has been no prune aphid infestation in any of the three test plots in Monte's orchard.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust began to appear in Monte's orchard in early August. The percentage of trees with rust was 15 % in the ESPS, 5 % in the Conventional, and 0 % in the Check plot. With harvest only two weeks away, there was not a high risk of significant pre-harvest defoliation occurring. No treatments for prune rust were recommended or applied to any of the test plots.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 20 % in the ESPS, 21 % in the Conventional, and 28 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 76 %, 47 %, and 61 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

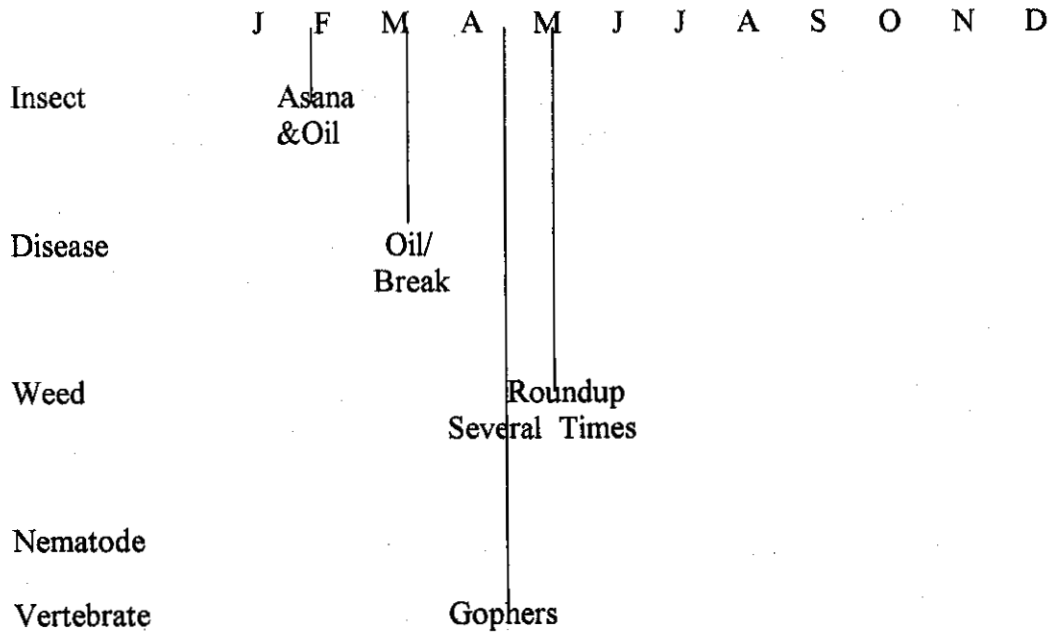
Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. .One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed .4 % worm damage in the ESPS, .2 % in the Conventional, and .6 % in the Untreated Check. The percentage of fruit with San Jose scale present was 2.4 % in the ESPS, 2.0 % in the Conventional, and 7.6 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was above the 10% threshold and a dormant oil spray was applied to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatment recommendation was made.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2 (Asana + oil and "bloom time" fungicide)

Reduced risk block: 2 (oil and "bloom time" fungicide)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .2% worm, 0% brown rot, 2% fruit with scale. 0% defoliation from rust, 0% defoliation from mites

Reduced risk block: .4% worm, 0% brown rot, 2.4% fruit with scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Sutter-MJ	Overall	2.202	3.93	61	14

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7	0.73	2.7	4.8	1	1	0.7	<0.1	8.17	22.7

IRRIGATION SCHEDULING

Our records show that you applied 8 irrigations during the 1999 growing season.

12. BIFS, Gary Carlin, Live Oak, Sutter County

Over wintering San Jose scale levels in Gary's orchard were at 1 % with 0 % parasitism (below the 10 % treatment threshold). Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plot were not treated for scale. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphid control.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. No San Jose scale or parasitoids were caught in the pheromone traps in any of the test plots.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 136, 73, and 79, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other

Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence did not exceed the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 5 % in the ESPS plot, 3.75 % in the conventional, and 5 % in the untreated check. The larvae recovered were peach twig borer and oblique banded leafroller. No treatments were applied for these pests.

Random sampling in showed that 2.5 % of the trees in the ESPS plot and 1.25 % of the trees in the check plot were infested by mealy plum aphid. Only the ESPS plot had leaf curl plum aphids, with 1.25 % of the trees infested. There has been no prune aphid infestation in the conventional plot.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust began to appear in Gary's orchard in mid August. The percentage of trees with rust was 7.5 % in the ESPS, 0 % in the Conventional, and 7.5 % in the Check plot. With harvest only two weeks away, there was not a high risk of significant pre-harvest defoliation occurring. No treatments for prune rust were recommended or applied to the ESPS or Check. The conventional plot was treated with sulfur in early June.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 2.2 % in the ESPS, 6.7 % in the Conventional, and 4.4 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 13.3 %, 7.8 %, and 27.8 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. One percent of the fruit evaluated using the ONFIT procedure was infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 1.6 % worm damage in the ESPS, 0 % in the Conventional, and 1.4 % in the Untreated Check. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Trees with mealy plum aphids present had side cracks on 2.83 % of the fruit and end cracks on 5.83 % of the fruit (600 fruit evaluated). Trees with no aphids present had side cracks on 1.17 % of the fruit and end cracks on 3.67 % of the fruit (600 fruit evaluated).

Billiou Ranches

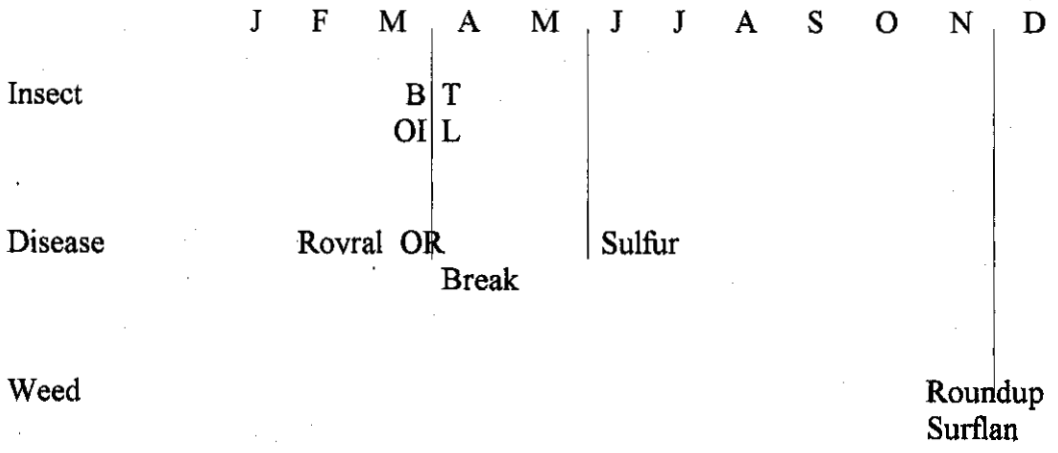
The Billiou Ranch site had a significant aphid problem this year and was the site of both an aphid release by Dr. Nick Mills, an aphidcide trial by Bill Krueger, UCCE Farm Advisor, Glenn County, and a harvest hand sample to check for cracking and quality from three 40 lb Dried Fruit Association (DFA) samples. The Mealy Plum Aphid (MPA) population infested the Check Block 100% and the entire east side of the BPS and Conventional Plots. The results showed more end cracks where there were MPA compared to very little from samples taken in non MPA areas, similar to results being compiled by Bill Olson, UCCE Farm Advisor Butte County.

The Fall Aphid sampling was done twice both early with 70 % leaves and late with 20 % leaves. This was the only orchard where there were no early aphids detected, but the late sampling did find aphids. They were rated moderate compared to the UCCE prototype model under development, and this orchard has been the site of Fall Aphid sampling problems before. Perhaps because it is adjacent to the town of Hamilton City it has aphids. The Billiou site has been the location of a perennial sod cover crop for 18 years.

The Billiou site is another 5 year BPS site with no Organophosphate or Pyrethroids applied on the BPS plot. Part of the site has had an oil spray for 4 years but both it and the Conventional received nothing in 1999. The quality was very good on the entire orchard. Last winter we planted areas of beneficial insectary shrubs in 8 areas of the 20 acres that is the BPS site. Several shrubs appeared to receive the herbicides Roundup and Goal and recover. Because the Billiou Site had several different parisitoides for the aphids released different years, the fact that mummified aphids were found last year at the site, and the abundance of flowering shrubs; the comparison of aphid populations at this long term site is very valuable to see if biological control of aphids can be enhanced.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest

is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified. No prune aphids were present in season.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no treatment was recommended to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records that no fungicides were applied.

Reduced risk block: Sampling did not indicate a population above the threshold, no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that up to 1% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE AND FUNGICIDE APPLICATIONS

Conventional block: 4 Total - Asana + Oil dormant, 2 "bloom" fungicides (Vangaurd and Captan), 1 Miticide (Vendex)

Reduced risk block: 2 Total – *B.t.* at bloom and Break.

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites.

Reduced risk block: 1.6% worm, 0% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites.

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Sutter-GC	Overall	2.213	2.48	52	19

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.4	0.08	0.4	0.2	0.1	<1	0.1	<0.1	<.05	0.0

IRRIGATION SCHEDULING

Our records show that you applied 4 irrigations to the ESPS plot during the 1999 growing season.

13. BIFS, Billiou Ranches, Glenn County

The Billiou Ranch site has continued to offer the most problems with pests of the five BPS sites. The levels of PTB and Leafrollers was monitored through July but never reached a treatable level. The PCA never the less did recommend a Bt spray in combination with a Rust spray in mid July in anticipation of a large PTB flight. The webspinning mites appeared along the road edges and then through out the orchard in July, but the predators have kept them under the economic threshold even though there was concern that they might need to be treated.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique' (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by *Monilinia fruticola* or *Monilinia laxa*. This technique

showed a 1 % infection of Brown Rot which was below the treatable level of 5%. At harvest there was no Brown Rot present in the sample.

The pressure bombing technique of monitoring tree stress was conducted weekly through this quarter up until harvest. Thereafter a post harvest reading and another reading after the irrigation will be taken. Because the orchard has a flood system, the grower has not tried to stress the trees with the information of the pressure bomb readings. His current program is to water every other row, every other week. With this system the trees are never under stress and the owners belief is that this leads to a bigger crop and healthier trees. Because this is a high pH site with older trees where water infiltration is an issue, this management style may be from experience the best way to raise prunes on this site.

The aphids at this site were the worst of any of the five BPS sites. As mentioned in the previous report this was the site of a aphidcide trial by Bill Krueger and a release of MPA parasitoides by Nick Mills. The aphids for the most part continued to exist all summer and were the thickest in the Check block and the parts of the BPS block. They were less evident in the Conventional block which is further away from the edges.

The fruit was checked for the final harvest evaluations aphids and cracking. There did seem to be a correlation between aphids and more side cracks with the BPS and the Check blocks having about twice as many side cracks as the same blocks without aphids. There was a considerable amount of small end cracks, but this did not seem to relate to the aphids. As far as the worm damage, it did not score as significant.

The Billiou Ranch site had a significant aphid problem this year and was the site of both an aphid release by Dr. Nick Mills, an aphidcide trial by Bill Krueger, UCCE Farm Advisor, Glenn County, and a harvest hand sample to check for cracking and quality from three 40 lb Dried Fruit Association (DFA) samples. The Mealy Plum Aphid (MPA) population infested the Check Block 100% and the entire east side of the BPS and Conventional Plots. The results showed more end cracks where there were MPA compared to very little from samples taken in non MPA areas, similar to results being compiled by Bill Olson, UCCE Farm Advisor Butte County.

The Fall Aphid sampling was done twice both early with 70 % leaves and late with 20 % leaves. This was the only orchard where there were no early aphids detected, but the late sampling did find aphids. They were rated moderate compared to the UCCE prototype model under development, and this orchard has been the site of Fall Aphid sampling problems before. Perhaps because it is adjacent to the town of Hamilton City it has aphids. The Billiou site has been the location of a perennial sod cover crop for 18 years.

The Billiou site is another 5 year BPS site with no Organophosphate or Pyrethroids applied on the BPS plot. Part of the site has had an oil spray for 4 years but both it and the Conventional received nothing in 1999. The quality was very good on the entire orchard. Last winter we planted areas of beneficial insectary shrubs in 8 areas of the 20 acres that is the BPS site. Several shrubs appeared to receive the herbicides Roundup and Goal and recover. Because the Billiou Site had several different parisitoides for the aphids released different years, the fact that mummified aphids were found last year at the site, and the abundance of flowering shrubs; the comparison of aphid populations at this long term site is very valuable to see if biological control of aphids can be enhanced.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole years, use the sections below by marking the month that a pest is typically controlled, and the pesticide or control method used and primary target).

J F M A M J J A S O N D

Insect:

Aphids Asana & Oil
PTB Asana & Oil
Mites

Disease:

Brown Rot Break
Scab

Weed:

Strips Roundup, Solicam, and Goal

Nematode:

Vertebrate:

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: No dormant spray was applied and only MPA infected the east edge late in the season..

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids but both LCPA and MPA were severe. The LCPA had a treatment of oil at 4 gal acre, but was largely inefficient to the curled up leaves. The MPA threshold went from 15 % to 70% in a week and then spread across part of the orchard the rest of the season.. They were untreated and there was an abundance of generalist insect predators.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: Our dormant spur sample indicated SJS was 5% with 4% being parasitized which was below the 10% threshold and no dormant spray was applied.

Reduced risk block: Our dormant spur sample indicated SJS was 8% with 4% being parasitized which was below the 10% threshold and no dormant spray was applied.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: No dormant was applied and sampling did not indicate a significant population during the Spring.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made although web spinning and Brown Almond mites are found throughout the orchard..

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatment recommendation was made.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 1% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 1 (Brown Rot Bloom)

Reduced risk block: 2 (Brown Rot Bloom, Oil 4 gal for LCPA)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 0.8% worm, 0% brown rot, 0% fruit with scale. 0% defoliation from rust, 0% defoliation from mites

Reduced risk block: .2.4% worm, 0% brown rot, 0% fruit with scale, 0% defoliation from rust, 0% defoliation from mites

IRRIGATION SCHEDULING

Our records show that you applied water every other row every other week during the 1999 growing season.

14. ESPS, Willow Glenn Orchards, Glenn County

One percent of dormant spurs sampled had parasitized scale and no live San Jose scale were found over wintering on dormant spur samples from the Willow Glenn orchard. Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plot were not treated for scale or over wintering aphid eggs.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. No San Jose scale or Aphytis parasitoids were caught in the pheromone traps in any of the test plots. Prospatella wasps were caught in large number in all three test plots: 1695 in the ESPS, 982 in the conventional, and 1799 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 535, 758, and 1037 respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 8.75 % in the ESPS plot, 10.25 % in the conventional, and 8.75 % in the untreated check. Damage was caused by peach twig borer and oblique banded leafroller. No treatments were applied for these pests.

All three plots had leaf curl plum aphid present. The ESPS, conventional, and the check plots had leaf curl plum aphid present on 5.33 %, 5.0 %, and 5.33 % of the trees, respectively. Approximately 16 % of the trees in the ESPS and 16 % of the trees in the check were infested with mealy plum aphid. No mealy plum aphids were present in the conventional plot. No in-season treatments were applied to any of the test plots for prune aphids.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust began to appear in the Willow Glenn orchard in mid-July. On July 30 the ESPS and the check plot were treated with sulfur and the conventional plot was treated with Captan and sulfur for control of brown rot and prune rust. On August 11 the percentage of trees with rust was 93 % in the ESPS, 38 % in the Conventional, and 93 % in the Check plot.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 6.6 % in the ESPS, 1.1 % in the Conventional, and 6.6 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 31 %, 6.6 %, and 31 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. On July 30 the ESPS and the check plot were treated with sulfur and the conventional plot was treated with Captan and sulfur for control of brown rot and prune rust.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.
In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated

for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 2.2 % worm damage in the ESPS and 8.0 % in the Conventional. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional. No parasitized San Jose scale was present on fruit in any of the test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Trees with mealy plum aphids present had side cracks on 1 % of the fruit and end cracks on 3.6 % of the fruit. Trees with no aphids present had side cracks on .6 % of the fruit and end cracks on 3.8 % of the fruit.

Fruit brown rot was present on .1 % of the fruit in the ESPS plot, 0 % in the Conventional.

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated there would not be prune aphids present the following spring. No treatment was recommended. Approximately 16 % of the trees had mealy plum aphid present by mid-June, then declined to less than 10% for the remainder of the year. No treatments were applied. Parasitoid releases of Aphidius magdae were made in June.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS did not exceed the 10% threshold and no treatments were recommended.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatments were applied.

PRUNE RUST

Conventional block: Two sulfur treatments were applied, one prior to rust syptoms and one after onset of symptoms.

Reduced risk block: Sampling did indicate a population above the treatment threshold and one sulfur treatment was made.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and one fungicide application was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 4 (Asana + oil) + (1 blossom brown rot fungicide-Break, 1 sulfur, and 1 fruit brown rot & rust fungicide-sulfur+Captan)

Reduced risk block: 2 (1 blossom brown rot fungicide-Break and 1 rust fungicide-sulfur)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 8% worm & surface damage seen only on green fruit, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites

Reduced risk block: 2.2% worm, 0% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY, 1999

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Glenn-WG	Conv.	2.614	3.55	58	93
Glenn-WG	ESPS	2.306	2.73	54	36

WATER ANALYSIS, 1998

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N Ppm	Lbs. N per Acre Foot
7.7	0.63	3.1	2.5	1.3	1	1	0.3	5.18	14.4

IRRIGATION SCHEDULING

Our records show that you applied 7 irrigations to the ESPS plot during the 1999 growing season.

15. PMA, Mariani Plant # 2, District 10, Yuba County

Over wintering San Jose scale levels in the Mariani orchard were at 23 % with 2 % parasitism (over the 10 % treatment threshold). Asana + oil was applied to the conventional plot during dormancy while oil alone was applied to the ESPS plot for the suppression of over wintering scale. The check was not treated for scale. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphid control.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 7, 4, and 30, respectively. Prospatella wasps were caught in two of the test plots: 30 in the ESPS and 53 in the check. Male scale catches totaled zero in the ESPS plot, 1 in the conventional, and 24 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 932, 469, and 986, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the

treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 8.75 % in the ESPS plot, 7.5 % in the conventional, and 11.25 % in the untreated check. Although a significant number of shoot tips were damaged by larval feeding, only a few live larvae were recovered from damaged shoot tips and virtually no larvae were found to be attacking fruit. The larvae recovered were peach twig borer, oriental fruit moth and oblique banded leafroller with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.

There has been no prune aphid infestation in any of the three test plots in the Mariani orchard.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust has not been found in the test plots at the Mariani orchard this year, however, sulfur was applied to all three test plots in early June.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 31 % in the ESPS, 21 % in the Conventional, and 27 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to ESPS and check plot. The conventional block was treated with Vendex on June 17 and again on July 22. Mite predators were present in large numbers in all three plots. Predatory mite populations were reduced significantly after treatments were applied to the conventional plot, but recovered incrementally with the web spinning mite population. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 39 %, 29 %, and 39 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. One percent of the fruit evaluated using the ONFIT procedure was infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10

fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.
In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 1.4 % worm damage in the ESPS, 1.2 % in the Conventional, and 3.2 % in the Untreated Check. The percentage of fruit with San Jose scale present was 1.4 % in the ESPS, .4 % in the Conventional, and 4.0 % in the Untreated Check. Parasitized San Jose scale on fruit was present only in the ESPS plot (.2 %). No parasitized San Jose Scale was found on fruit in the Conventional or the Untreated Check plot. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).

	J	F	M	A	M	J	J	A	S	O	N	D
Insect	Asana+Oil						Miticide occasionally					
Disease		Captan 2x										
Weed	Roundup 4 x (January-Sept)											
Nematode												

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified. No prune aphids were present in season.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was above the 10% threshold and a dormant oil spray was applied to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate 2 Vendex treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendations was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate 1 sulfur treatment was applied.

Reduced risk block: Sampling did not indicate a population above the threshold and 1 treatment was applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that up to 1% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 5 (Asana + oil, "bloom time" fungicide, Vendex 2x, and sulfur for prune rust)

Reduced risk block: 3 (oil, "bloom time" fungicide, sulfur for prune rust)

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 1.2% worm, 0% brown rot, .4% fruit with San Jose scale, 0% of trees had some defoliation from rust (primarily non-bearing trees), 0% defoliation from mites

Reduced risk block: 1.4% worm, 0% brown rot, 1.4% fruit with San Jose scale, .2% of the fruit had parasitized San Jose scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Yuba-M	Overall	2.199	3.39	47	18

WATER ANALYSIS

pH	EC	Ca	Mg	Na	SAR	Cl	B	NO3-N	Lbs. N per

	mmhos/cm	meq/L	meq/L	meq/L		meq/L	ppm	ppm	Acre Foot
7.1	0.55	<0.1	<0.1	1	<1	0.3	<0.1	1.76	4.9

IRRIGATION SCHEDULING

Our records show that you applied 9 irrigations to the ESPS plot during the 1999 growing season.

16. CSREES, Kulwant Johl, District 10, Yuba County

Over wintering San Jose scale levels in Kulwant's orchard were at 22 % with 1 % parasitism (over the 10 % treatment threshold). Asana + oil was applied to the conventional plot during dormancy while oil alone was applied to the ESPS plot for the suppression of over wintering scale. The check was not treated for scale. Based on ESPS Protocol # 6 (Fall Presence-Absence Monitoring of Prune Trees for Prediction of Springtime Aphid Populations), no preventative treatments were applied to the ESPS test plot for prune aphid control.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. The number of Aphytis wasps recovered from the ESPS, Conventional, and Check plots totaled 3, 3, and 5, respectively. Prospatella wasps were caught in all three plots: 41 in the ESPS, 6 in the conventional, and 3 in the check. Male scale catches totaled 59 in the ESPS plot, 19 in the conventional, and 36 in the check.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 409, 287, and 599, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex, and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

The percentage of trees with larval damage or larval presence was above the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was 7.5 % in the ESPS plot, 7.5 % in the conventional, and 11.25 % in the untreated check. Although a significant number of shoot tips were damaged by larval feeding, only a few live larvae were recovered from damaged shoot tips. Larvae were also found to be attacking fruit. The larvae recovered were peach twig borer, codling moth and oblique banded leafroller with wasp parasitoids being recovered from some of the leafroller larvae that were reared in the laboratory. No treatments were applied for these pests.

There has been no prune aphid infestation in any of the three test plots in Kulwant's orchard.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Growers that decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust began to appear in Kulwant's orchard in early August. The percentage of trees with rust was 75 % in the ESPS, 75 % in the Conventional, and 42 %

in the Check plot. With harvest only three weeks away, there was not a high risk of significant pre-harvest defoliation occurring. No treatments for prune rust were recommended or applied to any of the test plots.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 31 % in the ESPS, 34 % in the Conventional, and 30 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in large numbers. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 27 %, 34 %, and 34 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

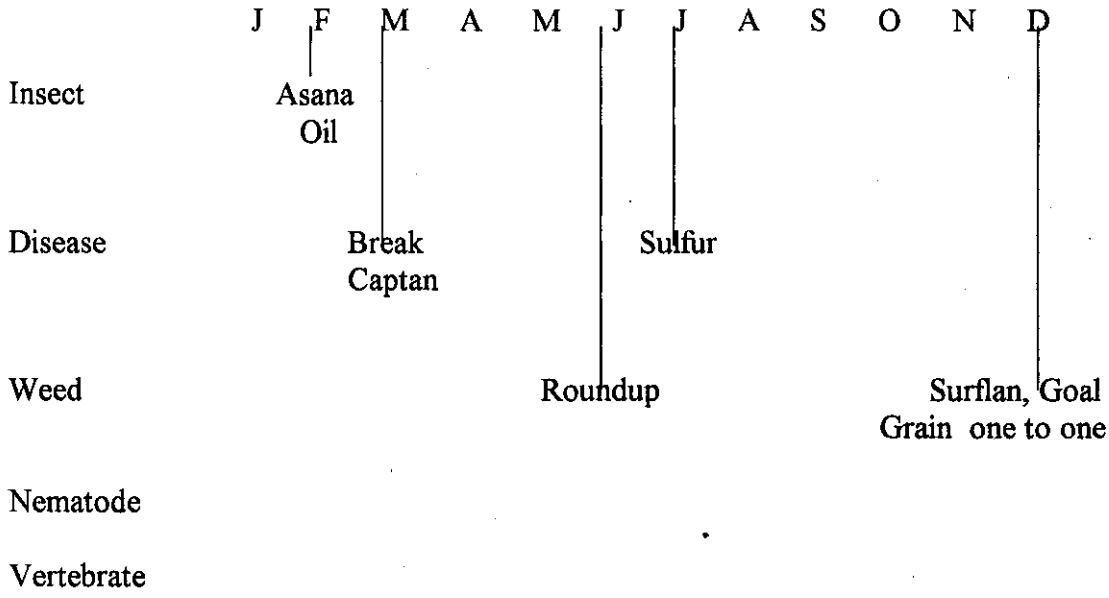
Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed 5.0 % worm damage in the ESPS, 1.2 % in the Conventional, and 8.0 % in the Untreated Check. The percentage of fruit with San Jose scale present was 1.6 % in the ESPS, 1.2 % in the Conventional, and 1.8 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was some defoliation due to prune rust on approximately 10% of the trees. Defoliation occurred primarily on young replant trees. Virtually no defoliation due to prune rust occurred on mature, bearing prune trees. There was no defoliation due to web spinning mites in any of the test plots. No fruit brown rot was observed in any of the three test plots.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).



The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Our fall aphid monitoring indicated you would have very few aphids and a dormant spray for aphids was not justified. No prune aphids were present in season.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was above the 10% threshold and a dormant oil spray was applied to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Sampling did not indicate a population above the threshold and no treatment recommendation was made.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE OR FUNGICIDE APPLICATIONS

Conventional block: 2 (Asana + oil) and fungicide at "bloom time"

Reduced risk block: 2 (oil) and fungicide at "bloom time"

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: 1.2% worm, 0% brown rot, 1.2% fruit with scale, 10% of trees had some defoliation from rust (primarily non-bearing trees), 0% defoliation from mites

Reduced risk block: 5.0% worm, 0% brown rot, 1.6% fruit with scale, 0% defoliation from rust, 0% defoliation from mites

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Yuba- KJ	Overall	2.333	2.92	57	36

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7	0.66	2.7	3.9	1.3	1	0.5	0.1	1.71	4.8

IRRIGATION SCHEDULING

Our records show that you applied 7 irrigations to the ESPS plot during the 1999 growing season.

17. BIFS, Joe Turkovitch, Winters, Yolo County

No over wintering San Jose scale or parasitized scale were found in the dormant spur samples in Joe's orchard. Asana + oil was applied to the conventional plot during dormancy. The ESPS and the check plot were not treated for scale. The ESPS plot was treated with oil to kill over wintering aphid eggs based on past history of aphid infestation in that orchard.

Pheromone traps were used to monitor male San Jose scale from the over wintering generation as well as two parasitoids that attack SJS, Aphytis melinus and Prospatella. Traps were monitored until the end of the over wintering generation. No San Jose scale or parasitoids were caught in the pheromone traps in any of the test plots.

Peach twig borer moths caught in ESPS, Conventional and Check totaled 363, 228, and 268, respectively. The peach twig borer pheromone traps are used primarily as a tool to determine optimum spray timing if in-season P.T.B. populations exceed the treatment threshold set in ESPS Protocol # 3 (Monitoring for P.T.B, Leafroller Complex,

and Other Larvae using Blossom and Shoot Tip Sampling). Larvae recovered using this sampling technique are reared in the laboratory, then identified as adult moths.

Larval damage or larval presence was below the 5% treatment threshold in the three test plots. The highest level of damage from any one sampling period was .5 % in the ESPS plot, 0 % in the conventional, and .25 % in the untreated check. Damage to shoot tips was caused by "green fruit worm".

There has been no aphid infestation in the conventional plot. The ESPS and the check plot had leaf curl plum aphid infestation. Approximately 12 % of the trees in the ESPS and 8 % of the trees in the check were infested. Although leaf curl plum aphid populations exceeded the 10 % treatment threshold in the ESPS plot, a treatment was not applied because the aphid colonies were rapidly producing winged forms and leaving the orchard.

ESPS Protocol # 5 (Prune Rust Monitoring) is used to establish treatment timing for the ESPS plot. Grower who decide to apply a treatment to suppress the development of prune rust in the conventional plot have agreed to treat the ESPS plot according to treatment timing recommendations established in this protocol. A final evaluation will take place to measure differences in pre-harvest defoliation caused by prune rust in each of the three plots. Prune rust has been found on only one tree Joe's orchard thus far. It was located in the conventional block.

Presence absence sequential monitoring for web spinning mites in prunes is used to determine if mite populations exceed treatment thresholds. The percentage of leaves with web spinning mites present did not exceed 1.1 % in the ESPS, 2.2 % in the Conventional, and 0 % in the check during any given sampling period. Mite populations did not exceed the 53 % treatment threshold during the season and no miticides have been applied to any of the three test plots. Mite predators were present in all three test plots. The percentage of leaves with western predatory mites or six spotted thrips present in the ESPS, Conventional, and Check were 6.6 %, 5.6 %, and 21 %, respectively.

A predictive model for estimating brown rot infection has been developed by Themis Michailides, plant pathologist at the Kearney Agricultural Center. The "Overnight Freezing Technique" (ONFIT) developed by Themis involves freezing green fruit to reveal latent infections by Monilinia fruticola or Monilinia laxa. Levels of latent infection revealed using the ONFIT model have been correlated to levels of brown rot infection that will become visible in the field later in the season as well as post harvest infection. This information is used to determine the need to protect fruit from brown rot infection with an in-season fungicide application. Zero percent of the fruit evaluated using the ONFIT procedure were infected by brown rot. No fungicide treatments were recommended or applied for the control of fruit brown rot.

Final plot evaluations have recently been completed in all of the comparison orchards. All evaluations were done just prior to harvest. Five hundred fresh fruit (10 fruit from 50 different trees) from each test plot have been evaluated for the presence of San Jose Scale, larval (worm) damage, and for the presence of live larvae.

In orchards where prune aphids were present, 10 trees that were infested and 10 trees that were not infested have been evaluated for fruit cracking. One hundred fruit on each tree were scored for the presence of side and end cracks.

Trees that were monitored throughout the season for prune rust were evaluated for defoliation just prior to harvest (40 trees per plot). Ten trees in each plot were evaluated

for defoliation caused by web spinning mites. In each plot, two thousand fruit (100 fruit from 20 trees) were scored for brown rot infection.

Pre-harvest fruit evaluations showed .2 % worm damage in the ESPS, .2 % in the Conventional, and .4 % in the Untreated Check. The percentage of fruit with San Jose scale present was 0 % in the ESPS, 0 % in the Conventional, and 0 % in the Untreated Check. No parasitized San Jose scale was present on fruit in any of the three test plots. There was no defoliation due to prune rust or web spinning mites. No fruit brown rot was observed in any of the three test plots.

The following is what we found in your orchard in regard to the various things we monitored for:

APHIDS

Conventional block: The dormant Asana and oil treatment applied effectively controlled prune aphids that may have been present.

Reduced risk block: Dormant spur sampling indicated that there would be a high level of prune aphids present in the spring. Application of oil was recommended.

Sampling showed that 12% of the trees in the ESPS plot had leaf curl plum aphids present.

SAN JOSE SCALE AND EUROPEAN RED MITE EGGS

Conventional block: The dormant Asana and oil treatment applied effectively controlled these pests.

Reduced risk block: Our dormant spur sample indicated SJS was below the 10% threshold and no treatment was recommended to control SJS.

PEACH TWIG BORER AND LEAF ROLLERS

Conventional block: The dormant Asana and oil treatment applied effectively reduced populations of these pests.

Reduced risk block: Tree sampling did not indicate a significant population of these pests and no treatment was recommended.

WEB SPINNING MITES

Conventional block: Sampling did not indicate a population above the treatment threshold and our records indicate no treatments were applied.

Reduced risk block: Sampling did not indicate a population above the treatment threshold and no treatment recommendation was made.

PRUNE RUST

Conventional block: Sampling did not indicate a population above the threshold and our records that no fungicides were applied.

Reduced risk block: Sampling did not indicate a population above the threshold, no treatments were applied.

FRUIT BROWN ROT

Conventional block: Sampling did not indicate a population above the threshold and our records indicate no treatment was made.

Reduced risk block: Laboratory screening of green fruit indicated that 0% of the fruit would be infected with brown rot at harvest. No treatment recommendation was made.

NUBMBER OF INSECTICIDE AND FUNGICIDE APPLICATIONS

Conventional block: 2 Total - Asana + Oil dormant, 1 "bloom" fungicide.

Reduced risk block: 2 Total – Oil at dormancy, 1 bloom fungicide.

HARVEST TIME FRUIT AND TREE EVALUATIONS

Conventional block: .2% worm, 0% brown rot, 0% fruit with San Jose scale, 0% of trees had some defoliation from rust, 0% defoliation from mites.

Reduced risk block: .2% worm, 0% brown rot, 0% fruit with San Jose scale, 0% defoliation from rust, 0% defoliation from mites.

TREE FERTILITY

County & ID	Treatment	N-Total (%)	K-Total (%)	B (ppm)	Zn (ppm)
Yolo-T	Conv.	3.353	1.82	46	51
Yolo-T	ESPS	2.467	2.2	51	50
Yolo-T	Check	2.464	2.08	52	47

WATER ANALYSIS

pH	EC mmhos/cm	Ca meq/L	Mg meq/L	Na meq/L	SAR	Cl meq/L	B ppm	NO3-N ppm	Lbs. N per Acre Foot
7.3	0.88	2.9	5.7	2.1	1	1.6	0.4	6.28	17.5

IRRIGATION SCHEDULING

Our records show that you applied 14 irrigations to the ESPS plot during the 1999 growing season.

18. ESPS, Greenleaf Orchards, Merced County

In the Greenleaf orchard there was also a low number of overwintering scale. 0% of the spurs showed any San Jose scale. Red Mite eggs were low with 34% in the Conventional and 5% in the ESPS.

Pheromone traps were used to monitor San Jose scale as well as the parasites Prospatella and Aphytis. To date the scale counts have been 366 in the ESPS, 16in the Conventional, and 872 in the Check. Aphytis totals in the ESPS, Conventional and Check were 18, 6, and 3 respectively. Prospatella counts were higher with 2205 in the ESPS, 1051 in the Conventional, and 575 in the Check.

Pheromone traps were also used to monitor PTB and OBLR. Peach twig borer moths caught in the ESPS and Conventional totaled 277 and 438 respectively. OBLR counts were 65 in the ESPS and 110 in the Conventional.

Mite counts have been low so far with 13 in the ESPS, 7 in the Conventional, and 2 in the Check. Aphid counts are low so far with only about 3 or 4 MPA showing up in the ESPS and Check blocks but nothing so far in the Conventional

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).

	J	F	M	A	M	J	J	A	S	O	N	D
Insect			Diazinon + oil Every other row				B.t. on occasion					
Disease			Bravo				Sometimes Rovral					
Weed		Goal Roundup Solicam			Roundup		Roundup					
Nematode												
Vertebrate					Phostoxin							

19. OMA, Thiara Brothers, Merced County

In the Thiara Brothers orchard there was a low number of overwintering scale. 0% of the spur samples showed any scale. 0% had any Red Mite eggs.

Pheromone traps were used to monitor San Jose scale as well as the parasites Prospatella and Aphytis. To date the scale counts have been 381 in the ESPS, 1in the Conventional, and 219 in the Check. Aphytis totals in the ESPS, Conventional and Check were 11, 42, and 8 respectively. Prospatella counts were higher with 1043 in the ESPS, 553 in the Conventional, and 683 in the Check.

Pheromone traps were also used to monitor PTB and OBLR. Peach twig borer moths caught in the ESPS and Conventional totaled 1377 and 545 respectively. OBLR counts were 233 in the ESPS and 174 in the Conventional.

Mite counts have been low so far with 17 in the ESPS, 31 in the Conventional, and 10 in the Check. Aphid counts are low so far with only about 1 or 2 MPA showing up in the ESPS and Check blocks but nothing so far in the Conventional.

Pest control program (grower/conventional i.e. what has been the growers typical pest control program for whole year, use the sections below by marking the month that a pest is typically controlled, pesticide or control method used and primary target).

	J	F	M	A	M	J	J	A	S	O	N	D
Insect		X										
Disease			X									
Weed	X (preemergent)											
Nematode												
Vertebrate												

20. ESPS, Dan Aguiar, Tulare County

Dan Aguiars orchard had a fair number of overwintering San Jose scale. There was 12% in the ESPS, 28% in the check, and 15% in the conventional. European Red mite eggs were relatively high with 31% in the ESPS, 46% in the check, and 88% in the conventional.

Pheromone traps were used to monitor San Jose scale as well as the parasites Prospatella and Aphytis. To date scale counts have been 274 in the ESPS, 982 in the Check, and 1270 in the Conventional. Aphytis totals in the ESPS, Check, and Conventional blocks were 131, 346 and 45 respectively. Prospatella counts were considerably higher with 1954 in the ESPS, 3279 in the check, and 385 in the conventional.

Pheromone traps were also used to monitor PTB and OBLR. Peach twig borer moths caught in the ESPS, Conventional, and Check totaled 5202, 3162, and 1638 respectively. OBLR totals were 687 in the ESPS, 341 in the Check, and 478 in the Conventional.

Mite counts have diminished in all three blocks. Many predator mites and six-spotted thrips were present.

Brown rot was also low in the orchard. The results of the freezing experiment were 0 in the ESPS and the Conventional. Before harvest three trees were spotted in the Check that had brown rot on them. The total was 14 infected fruit. The ESPS and Conventional had 0 brown rot.

The results of the final evaluations were relatively low. The numbers for all three blocks averaged out to be .77 in the ESPS, .03 in the Conventional, and 1.61 in the check. Those numbers were per 500 fruit. Fall aphid numbers were 0 in all three blocks.

21. BIFS, Campos Brothers, Fresno County

Campos's orchard had a low number of overwintering San Jose scale. There was 0% in the ESPS and 3% in the Conventional. European Red mite eggs were low in the ESPS at 2% but were relatively higher in the Conventinal at 45%.

Pheromone traps were used to monitor San Jose scale as well as the parasites Prospatella and Aphytis. To date scale counts have been 194 in the ESPS and 110 in the Conventional. Aphytis totals in the ESPS and Conventional blocks were 4 and 9 respectively. Prospatella counts were considerably higher with 1264 in the ESPS and 518 in the conventional.

Pheromone traps were also used to monitor PTB and OBLR. Peach twig borer moths caught in the ESPS and Conventional totaled 814 and 443 respectively. OBLR totals were 542 in the ESPS and 501 in the Conventional. No brown rot was seen out in the field nor did it show up in the freezing experiment.

The results of the final evaluations were relatively low. The numbers for both blocks averaged out to be 0 SJS per fruit. Those numbers were per 500 fruit. Fall aphid numbers were 0 in both blocks

22. PMA, Sherman Thomas Ranch, Madera County

The Sherman Thomas orchard had a low number of overwintering San Jose scale. There was 0% in the Organic block and 6% in the Conventional. European Red mite eggs were low in the Organic block at 0% while the Conventional block was much higher at 48%.

Pheromone traps were used to monitor San Jose scale as well as the parasites Prospatella and Aphytis. To date scale counts have been 44 in the Organic and 12,978 in the Conventional. Aphytis totals in the Organic and Conventional blocks were 13 and 395 respectively. Prospatella counts were considerably higher with 8997 in the Organic and 33,509 in the conventional.

Pheromone traps were also used to monitor PTB and OBLR. Peach twig borer moths caught in the Organic and Conventional totaled 1022 and 1501 respectively. OBLR totals were 317 in the Organic and 425 in the Conventional. No brown rot was seen in either block.

The results of the final evaluations were relatively low. The numbers for both blocks averaged out to be 0 SJS per fruit in the Organic, .004 in the Conventional. Those numbers were per 500 fruit. Fall aphid numbers were 0 in both blocks.